

# POSTER SESSION

Monday, May 7, 2001  
Tuesday, May 8, 2001

POSTERS





## **THE IMPACT OF A SPOUSE WHO HAS SUSTAINED A SEVERE CLOSED HEAD INJURY ON FAMILY FUNCTIONING AND THE PSYCHOLOGICAL WELL BEING OF THE PARTNER**

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### Objectives:

1. Develop and test a model of psychological distress to illustrate the relationship posited to exist between neurobehavioural problems, family functioning and psychological distress experienced by the spouses/caregiver.
2. Identify differences in psychological distress experienced by the spouse/caregiver when a male versus female spouse has a head injury.
3. Identify differences in family functioning when a male versus female spouse has a head injury.

This study used the Conservation of Resources theory and the McMaster Model of Family Functioning as a framework to strengthen the understanding of the effects of neurobehavioural problems of head injury on family functioning and psychological distress in spouses/caregivers.

The research design was an ex post facto design utilising a cross-sectional methodology. Those involved were 47 female and 17 male spouses/caregivers of partners with severe head injuries. The model developed was tested using path analysis to determine the nature and strength of the interrelationships between variables. Structured interviews were also conducted to elicit more in-depth information from spouses/caregivers regarding the impact of head injury on family functioning. The factors found to be of greatest importance were behavioural, cognitive, communication and social problems and family functioning. Behavioural and cognitive problems had the greatest influence on family functioning based on standardised scales, although the interviews revealed social problems were also related to family functioning. Further, family functioning had a moderate influence on psychological distress. In addition, behavioural, communication, and social problems also had a direct influence on psychological distress.

There was no significant difference in family functioning or psychological distress between male and female spouses/caregivers when gender was considered as factor. Despite the development of Brain Injury Programs in New South Wales, much more needs to be done. This was reflected in by the high levels of ineffective family functioning and psychological distress reported. This clearly illustrates the urgent need for further planning and recognition at policy level by government and service providers.



*References:*

- Anderson, M. (1999). *The impact of a spouse who has sustained a severe closed head injury on family functioning and the psychological well being of the partner. Unpublished PhD dissertation, Macquarie University: Ryde, NSW.*
- Epstein, N.B., Bishop, D.S. & Levin, S. (1978). *The McMaster Model of Family Functioning. Journal of Marriage and Family Counseling, 4, 19-31.*
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## EXPERIENCE WITH INTERDISCIPLINARY OUTPATIENT PROGRAMME FOR PEOPLE AFTER SEVERE T B I

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Objectives:

1. The Description of Multidisciplinary Team.
2. The Individual Programmes.
3. Assessment and Evaluation of Patients.

Long term rehabilitation of people after severe TBI is a great problem in our health care. We have very good acute care but there is no consistent system of post-acute care at all. Patients after severe TBI have a possibility to go to great Rehabilitation Institutions which are faraway from their relatives but after coming back from these facilities they have no possibility to continue in comprehensive rehabilitation using interdisciplinary outpatient programmes near their homes. We decided to start such outpatient programme on our department. We have multidisciplinary team (physicians, O.T.s, P.T.s, neuropsychologist, speech therapist) which takes care of the patients from Mondays to Fridays, beginning at 8:00 AM, finishing after 3:00 PM. The patient is referred to the programme by the physician. At the beginning of the programme there is a multidisciplinary assessment which is necessary for making individual programme for each patient. We use a lot of tests from neuropsychology, occupational therapy, speech therapy and physiotherapy. The poster shows basic test batteries which are used during the assessment. According to individual needs we plan the activities each week. The poster shows the timetable of the activities during the weeks. We have a possibility to work with the patient in this type of programme at least three weeks. When it is necessary we can prolong the stay. At the end of this programme, there is also final assessment and evaluation when we try to formulate final aims for further rehabilitation. The poster shows our first experience with this type of programme.



## **SCHOOL REINTEGRATION AFTER A PEDIATRIC TRAUMATIC BRAIN INJURY: EXAMPLE OF A FOLLOW-UP OVER 6 YEARS**

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### **Problem / objectives**

After the phase of extensive rehabilitation in specialized center, the question of the return in the common school circuit is wandered when the child with T.B.I is exempt from heavy functional sequelae and when he found approximately his previous school level. Now authors as JAFFE and RIVARA showed that the disruption of the developmental process in cognitive and academic areas appeared three years after the T.B.I. How to keep in touch in long term with these children and these families?

How to work with the professionals of the common schools?

### **Methodology**

Exhibition detailed with a help and accompanying follow-up, over 6 years, in common school background of a girl with T.B.I will allow us to discuss necessary conditions for the school reintegration.

The follow-up contains:

- A cognitive rehabilitation in external which evolves in the time according to the child's progress
- A psychotherapeutic help of the child
- The intervention of a specialized teacher with a double objective:
  1. Individual school support
  2. Information and education of the public teacher welcoming the child
- A work of parental guidance which implies the family in all the phases of the project.

### **Conclusion**

If the resistances of children with T.B.I and his family in the consideration of the cognitive handicap were predictable, those of the teaching background were less waited. This requires a particular thought within the framework of a interventional strategy in common school background.

### *References:*

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- *Jaffe K, Polissar NL, FAY GC, Liao S: Recovery trends over three years following pediatric traumatic brain injury. Arch Phys Med Rehabil; on 1995, 76, 17-26.*



## HEAD TRAUMA AS A NEGLECTED CAUSE OF NONCONVULSIVE STATUS EPILEPTICUS

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2. *Leonardo Cocito*, MD
3. *Lucio Marinelli*, MD
4. *Alberto Primavera*, MD

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### Objectives:

1. Underscoring the importance of EEG in head trauma.
2. Investigating the occurrence of nonconvulsive status epilepticus in patients with brain injury.

Nonconvulsive status epilepticus (NCSE) is a cause of prolonged impairment of consciousness which is often unrecognised, especially in critically ill patients. We reviewed the EEG findings of 218 consecutive patients who met the following criteria: 1) altered mental state or behaviour, 2) no clinical seizure activity, and 3) at least 20 minutes of bed recorded EEG. The group included 10 patients with traumatic brain injury. A diagnosis of NCSE was warranted if 1) there was continuous or nearly continuous seizure activity on EEG, and 2) EEG activity changed spontaneously or following antiepileptic medication. The EEG showed epileptiform discharges without clinical signs of convulsion in 35 patients (16%), and a diagnosis of NCSE was established in 23 patients (10.5%) of the whole group, and in 2 patients with trauma. These findings suggest that NCSE (which can be diagnosed only by EEG) may play a role in provoking impairment of consciousness also in traumatic brain injury. In agreement with Farnarier (1998), we underscore the importance of emergency EEG recording in patients with negative CT scan and whose consciousness impairment cannot be explained by the severity of brain injury. Indeed, Vespa et al (1999) recently showed that continuous EEG monitoring indicates a higher incidence of seizure and NCSE after head trauma. In conclusion, we feel that EEG is presently underused in comatose patients.

### References:

- *Farnarier G. Emergency indications of EEG in the situation of a head injury in children and adults. Neurophysiol Clin 1998;28: 121-33.*
- *Vespa PM, Nuwer MR, Nenov V, et al. Increased incidence and impact of nonconvulsive and convulsive seizures after traumatic brain injury as detected by continuous electroencephalographic monitoring. J Neurosurg 1999; 91: 750-60.*
- *Young GB. The EEG in coma. J clin Neurophysiol 2000; 17: 473-85.*



## INTEGRATED REHABILITATION PROGRAMS IN THE POST-ACUTE PHASE AFTER TRAUMATIC BRAIN INJURY

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3. **M.G. Gambini**, Psicologa, Centro Medico Sociale "C. Santi" Don Calabria, Verona, Italy
4. **S. Schena**, Direttore Centro Medico Sociale "C. Santi" Don Calabria, Verona, Italy

Objectives:

1. Description of a facility Centre for social and/or professional reintegration for TBI people.

Since 1994 different rehabilitation programs aimed at social and/or professional reintegration for patients suffering from traumatic brain injury (TBI) have been established in strict cooperation between an in-patient Rehabilitation Unit (UO III Livello for TBI people - Osp. Don Calabria, Negrar Verona) and a territorial rehabilitation facility (Centro Medico Sociale "C. Santi" - Centro Formazione Professionale Don Calabria Verona).

After discharge from the Rehabilitation Unit, TBI patients may enter four different program categories:

1. Social and vocational rehabilitation programs, which include stages in simulated or real work environments, for patients with good outcome (GOS 1)
2. Cognitive and neuromotor rehabilitation programs aimed at maximizing personal and social autonomy for patients with moderate outcome (GOS 2) after the in-patient rehabilitation phase.
3. Residential programs- when needed- are limited to a group of 6 subjects with variable outcome scores (GOS 1-2) who are partially responsible for the house management.
4. For patients with more severe outcome (GOS 3) simple occupational activities are organized in a separate environment (CEOD).

Group activities are organized for all TBI subjects in order to enhance social independence in different social contexts and environments.



## USING A COMPUTER BASED MULTIMEDIA APPROACH TO EDUCATE FAMILY MEMBERS ABOUT BRAIN INJURY

1. **Gregory L. Ayotte**, Director of Information Services, Brain Injury Association, Alexandria, VA, USA
2. **Tara L. McDonough**, Executive Director, National Brain Injury Research, Columbia, MD, USA

### Objectives:

1. Provide data that shows the effective use of multimedia programs as an educational tool.
2. Provide data that show the priorities of educational information based on environment.

In the early 1990's the Brain Injury Association, through funding from the Defense and Veterans Head Injury Program, Upjohn Pharmacia, and the Van Avery Foundation, developed the Brain Injury Resource Center (BIRC). The goal was to make available a user friendly, touch screen computer program that offered information and resources regarding brain injury and rehabilitation. No computer experience would be necessary to use the BIRC. The program would be available 24 hours a day, and family members could navigate the program at their own pace just by touching the computer screen. After three years of development, a computer based program that offered text, graphics and audio/video about brain injury was completed. The computer system was beta tested in Veteran, Military and Trauma Hospitals. It then became available to the general public. The system has been available for 5 years and has had 3 updates. It is currently available in approximately 57 sites across the United States, including military hospitals, civilian hospitals, attorney's offices, and at rehabilitation facilities. It has also been placed in two international locations.

In order to determine the effectiveness of the BIRC, a data program was designed to report user information. Information collected included the age group of the user, the relationship, if any, of the BIRC user to a person with a brain injury. In addition, information about the frequency of use and the information reviewed was tracked. What is presented in the poster is data from trauma centers, military and veteran hospitals, private facilities, attorney's offices etc.



## QUALITY OF LIFE 2 TO 6 YEARS AFTER A SEVERE TRAUMATIC BRAIN INJURY

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2. **L. Mailhan**, MD, Hôpital Raymond Poincaré, Garches, France
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4. **A. Dazor**, MD, PhD, INSERM/Script, Lyon, France

### Objectives:

1. Assess subjective aspects of quality of life 2 to 6 years after a severe traumatic brain injury.
2. Assess the relationships between life satisfaction and impairments, disability and handicap.

**Objective:** To assess satisfaction with life of severe TBI patients and their family.

**Patients and methods:** 50 patients hospitalized in a rehabilitation department after severe TBI from 1993 to 1995 were included. Quality of life was assessed by the Subjective Quality of Life Profile (SQLP) (1). Patients rated their satisfaction on a 5-point scale for 39 items related to various domains (e.g. interpersonal relationships, leisure and vocational activities...). These data were compared to ratings made by a close relative. Quality of life data were compared to impairments, disability and handicap.

**Results.** Patients' satisfaction was globally low, particularly for items related to cognitive functions, physical abilities and self-esteem. Family ratings of patients' satisfaction were parallel but lower than patients' ratings. Patients' satisfaction was significantly correlated with motor impairments, anxiety level, basic and advanced ADL, vocational status, and the Glasgow Outcome Scale score.

**Discussion and conclusion.** Severe TBI patients two to six years post injury demonstrated a relatively poor satisfaction with life. Satisfaction appeared to be affected by the presence of motor rather than cognitive impairments, and was significantly related to functional and vocational status.

### References:

1. *Dazard A, Gerin P, Boissel J. Subjective quality of life assessment in therapeutic trials: Presentation of a new instrument in France (SQLP: Subjective Quality of Life Profile) and first results. In: Orley J, Kuyken W, eds. Quality of Life Assessments: International Perspectives. Berlin: Springer Verlag, 1994:185-95.*



## **THE HAYLING AND BRIXTON TESTS OF DYSEXECUTIVE SYNDROME. WHAT DO THEY MEASURE IN EVERYDAY LIFE?**

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2. **David Nathaniel-James**, BA (Hons), MSc, PhD, DClinPsych, AFBPsS, Brain Injury Rehabilitation Unit (Edgware Community Hospital), Middlesex, UK

### Objectives:

1. To investigate the ecological validity of two recently created laboratory tests (Hayling & Brixton) (H&B).
2. To investigate how results obtained with these tests inform rehabilitation planning.

Measures used to plan rehabilitation are becoming more ecologically valid. Two recently created laboratory tests (Hayling & Brixton; Burgess & Shallice, 1997) (H&B) are being used in UK to inform rehabilitation. However it is unclear what they measure in every day function, and how this informs rehabilitation planning. The objective of this study is to investigate the ecological validity of these measures. 48 (36 males) participants were recruited at the Brain Injury Rehabilitation Unit's (BIRU) out-patient clinic (OPC). The majority had suffered a moderately to severely traumatic brain injury. Mean age was 45. The DEX questionnaire (a measure of dysexecutive difficulties in every day life) was completed by client and independent rater prior to the OPC. In keeping with recent studies in this area, independent DEX ratings were used. H&B and other measures of cognitive function and mood were administered. Three major factors of dysexecutive difficulties have been identified with the DEX (response suppression, intentionality and executive memory). H&B measures were correlated with these. A highly significant correlation between the Brixton (a measure of rule attainment) and the DEX executive memory factor was found. Significant correlations between Hayling A (a measure of initiation) and all DEX factors were observed. No significant correlations were observed for Hayling B (suppression). The Brixton test is a robust measure of executive memory and useful for planning rehabilitation. The results with the Hayling A suggests that this measure is sensitive to executive difficulties, but does not discriminate between executive factors. Further research is needed to identify what poor performance on the Hayling B measures in every day function, which we are currently undertaking.

### References:

- 1 **BURGESS P, SHALLICE T (1997):** *The Hayling and Brixton tests - manual.* Thames Valley Test Company Ltd: Bury St Edmunds, UK
- 2 **BURGESS PW, ALDERMAN N, EVANS J, EMSLIE J, WILSON B (1998):** *The ecological validity of tests of executive function. Journal of the International Neuropsychological Society; 4: 547-558*



## ADVANTAGES OF USING THE "SIX ELEMENT TEST" IN EVALUATION OF EXECUTIVE FUNCTIONS

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### Objectives:

1. To evaluate complementary information provided by Six Element Test (SET) in assessing executive functions in comparison with classical neuropsychological testing.
2. To evaluate the value of SET in predicting social outcome of brain injured patients.

The Six Element Test (SET) was designed by Shallice et Burgess (1991) as a method to assess executive functions in frontal lobes damaged patients. Patients have to self organise and complete six different tasks in a limited amount of time while respecting several rules.

The aims of this study were :

- (i.) To evaluate complementary information provided by SET in assessing executive functions in comparison with classical neuropsychological testing.
- (ii.) To evaluate the value of SET in predicting social outcome of brain injured patients.

Twenty eight patients ranging from 18 to 45 years were assessed in an Evaluation, Retraining and Socio-Professional Orientation Unit, using a french adaptation of SET (Garnier et al, 1998) and 16 neuropsychological tests assessing executive functions. Glasgow Outcome Scale (GOS) and an analysis of professional outcome were also carried out for all patients. Correlation analysis suggests that SET is an independent measure as it is statistically uncorrelated with performances in any of other neuropsychological tests. Only trends towards correlations between SET scores and WAIS III Blocks score (0.47), Wais III Matrix score (0.45) and WCST criteria score (0.45, were found. Interestingly, a trend towards correlation between number of errors in SET and GOS score was found (0.48). These results suggest that SET provides a more complex and integrated evaluation of executive functions than conventional testing. It also provides an ecological approach which could be useful for predicting patients' daily life rehabilitation.

### References:

- Shallice, T., Burgess, P.W. (1991). Deficit in strategy application following frontal lobes damage in man. *Brain*, 114, 727-741.
- Garnier, C., et al (1998). Une évaluation des fonctions exécutives chez les traumatisés crâniens: l'adaptation du test des 6 éléments. *Revue de Neuropsychologie*, 8, 385-414.

## ITALIAN TEENAGERS' KNOWLEDGE AND ATTITUDES TOWARD THE CAUSES AND CONSEQUENCES OF ROAD TRAFFIC ACCIDENTS: IMPACT OF AN EDUCATIONAL PROGRAM

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3. **Roberto Vitali**, Ufficio Informahandicap, Comune di Ferrara, Ferrara, Italy
4. **Paolo Boldrini**, MD, Dipartimento di Medicina Riabilitativa e Lungodegenza post acuzie, Ferrara, Italy

### Objectives:

1. To improve teenagers' knowledge of traumatic brain and spinal cord lesion caused by traffic accidents, and to modify risk behaviors, stimulating the utilization of safety device.
2. To modify common prejudices of teenagers toward the disabled persons, and improve their ability to interact with them.

An informational and educational project concerning the causes and consequences of traffic-related traumatic brain injuries (TBIs) and spinal cord injuries (SCIs) has been developed by the Rehabilitation Medicine Department of the Azienda Ospedaliera di Ferrara, with the contribution of the City Council of Ferrara.

The project is called "Salvati la Vita" (Save your life); it is addressed to teenagers and it includes presentation of educational material, conferences, visits to the rehabilitation centre and meetings with people affected by TBI. The project started in 1996; up to now, more than 2000 teenagers have been involved. In the early stages of the project, a structured questionnaire was administered before and after the program to evaluate short and long-term changes in students' knowledge about the causes and consequences of brain and spinal cord injuries, in their opinions/attitudes towards the disabled people, as well as in their behavior while driving. Significant and long-lasting modifications were observed in the participants' level of knowledge and in their opinions/attitudes, while minor changes were noted in their behavior. Most of the participants reported a positive opinion of the program. These results seem to support the effectiveness of this informational program in increasing teenagers' knowledge and in modifying their attitudes towards the disabling consequences of traffic accidents, and they suggest the need of further educational and support interventions in order to achieve behavioral modifications.



### PROJECT OF THE REVIVAL HOUSE (LUCA DE NEGRIS)

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4. **R. Piperno**, UO RRF Ospedale Maggiore, Bologna, Italy

#### Objectives:

1. Centrality of patient's system (patient and family).
2. Integration with the territorial services.
3. High degree of personalization and plurality of approaches to the recovery.

Adequacy and length of the rehabilitative involvement in patients with vegetative state is still under discussion. It is well recognized that these patients need to be treated with continuity and rarely this condition is fulfilled. "Gli amici di Luca", an association of voluntary service, is the promoter in association with Bologna's AUSL of the Revival House, an institute dedicated to post-acute rehabilitation of vegetative state.

#### The goals are:

- to accommodate temporary 10 patients
- to take care of basic functions
- to realise easy recovery of the vigilance and the conscience
- to provide a specific and continuous rehabilitation with an individual and structural project
- to provide support and training for the families.

#### Peculiarities of this projects are:

- possibility of prolonged stay (until 18 month)
- integration with the territorial services;
- centrality of patient's system (patient and family)
- structural project specificity (a residential module for each family unit)
- high degree of personalization and plurality of approaches to the revival.

The awareness revival is planned to be realised through a sensorial stimulation in a regulated environment. The active role of family is considered as a crucial step in maintaining the daily living rhythms and habits. The relatives will be involved in the assistance project and they will receive information, support and training. A trained staff will take care of the programmes related to nursing, secondary prevention, treatment complications and re-education related to motor, functional, cognitive and communicative functions. They will also plan the necessary technology for assistance and independence and, in collaboration with voluntary service, they will realise programs facilitating the recovery of the vigilance and the awareness. The structural cost is about 2 millions Euro, while 200 Euro is hospital day's cost. The structure will be completed within year 2002.

#### References:

- *Stonnington H.H., Brain Injury, may 2000, vol. 14, no. 5, 393-395*



## DERIVATION OF A DECISION RULE TO PREDICT POST-CONCUSSIVE SYNDROME AFTER MINOR TRAUMATIC BRAIN INJURY

1. **Jeffrey J. Bazarian**, MD, University of Rochester Medical Center, Rochester, NY, USA
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### Objectives:

1. To identify mTBI patients at low and high risk of PCS using variables generated by both logistic regression (LR) and recursive partitioning (RP).

**Introduction:** Up to 50% of patients with minor traumatic brain injury (mTBI) develop post-concussive syndrome (PCS) [Ref 1,2]. A decision rule to stratify risk for PCS could aid treatment efforts. Methods: Prospective, observational study of 71 mTBI patients age >16 presenting to the emergency department of a university teaching hospital. MTBI defined as LOC <10 minutes or amnesia, GCS 15, no skull fracture on physical exam, nonfocal neurologic exam and no brain injury on CT if one was done. Clinical /demographic data and brief neurobehavioral test battery collected on all patients. PCS determined via validated telephone questionnaire at 1 month.

**Analysis:** All variables subjected to both LR and RP. Results: 58% had PCS at 1 month. Low risk: PCS occurred in 9% of males scoring >24 on Hopkins Verbal Learning A (HVLA) (by LR), and in 9% of those injured in sports scoring >22 on HVLA (RP). High risk: PCS occurred in 89% of women scoring <9 on Digit Span (LR) and in 92% of those injured via falls or MVA scoring <11.5 on HVLB2 (RP).

**Conclusions:** Despite the high incidence of PCS, a decision rule using easily obtainable clinical variables and three simple neurobehavioral tests was able to identify a low risk subgroup with an average PCS risk of < 10% and a high-risk subgroup with a PCS risk of ~90%. Combining results from LR and RP expanded the number of patients able to be classified by the decision rule. Prospective validation is necessary.

### References:

1. *Bazarian JJ, Wong T, Harris M, et al. Epidemiology and predictors of post-concussive syndrome after minor head injury in an emergency population. Brain Injury. 1999; 13(3):173-189.*
2. *Levin HS, Mattis S, Ruff RM, et al. Neurobehavioral outcome following minor head injury: A three center study. J Neurosurgery 1987; 66:234-243.*



## EFFECTIVENESS OF THE COMBINED INTRAVENTRICULAR TRANSPLANTATION OF EMBRYONAL NERVOUS TISSUE UNDER RESTORATION OF MOVABLE DEFECT ON THE MODEL OF PARKINSONISM

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Comparative evaluation of different schemes of intra-brain and intraventricular transplantation of embryonal nervous tissue under experimental Parkinsonism has been carried out. Modelling of hemiparkinsonism has been carried out on 55 rats of Vistar line by stereotaxic of 6-hydroxidopamine into the right ascending mezostrial dopaminergic tract. Effectiveness of transplantation was considered by indices of apomorphine-induced rotation (AIR), rehabilitation of catecholamines level in the injured striatum (STR) and round-the-clock urine. Immunochemical analysis of tyrosinhydroxylase activity of neurons and highly liquid chromatography were used. Permeability of hematoencephalitic barrier has been evaluated by defining of the main astrocytal marker -GFAP- in blood serum.

It has been found that both intrastriar and combined transplantation of cellular preparations of the embryonal ventral mezecephalon (VM) in lateral ventricle lead to restoration of the function of dopaminergic nigrostriar system (DNS), which is characterized by decreasing of indices of AIR by more than 50%, increasing of catecholamines content in striatum and urine. Survival of dopaminergic neurons of the transplant increases considerably under combined transplantation by injection of VM preparation STR into the denervated striatum. Izolated intrastriar transplantation of the cellular preparations of STR and intraventricular one of the VM preparations do not considerably influence the regeneration of the denervated DNS.

In case of death of the considerable number of the transplanted neurons and the development of glyosis in the transplant and surrounding tissue considerable raise of GFAP concentration is seen during the first 4 weeks. High indices are to 12 weeks after transplantation. Under good consolidation of the transplant they are normalized by the end of the month.

**Conclusions:** 1. Combined intraventricular transplantation of the VM preparation makes survival of the dopaminergic neurons in the host brain better and gives the opportunity for restoration of the DNS function. Mentioned method may be used as an alternative to transplantation into striatum under Parkinson disease treatment. 2. Monitoring of the GFAP concentration in blood serum under transplantation of the embryonal nervous tissue makes it possible to evaluate the condition of the intra- brain transplant in living state and to make prognosis of the transplantation outcome.



## REMAINING COGNITIVE FUNCTIONS OR VEGETATIVE STATE IN SEVERELY BRAIN INJURED PATIENTS

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  4. *S. Andersson*
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### Objectives:

1. Vegetative/minimally conscious, assessment.

### Description

Evaluation of improvements in the sub-acute rehabilitation phase in patients with severe brain injuries classified as vegetative or minimal brain consciousness, often represents a difficult problem. We decided to use the method of Coma Recovery Scale (CRS) to quantify improvements in these patients.

### Methods

Eight patients were studied during a 12 months period using a method as described by Giacino et al. (1991). The parameters measured included visual and hearing functions, motor functioning, oromotor/verbal function, communication, and arousal. The observations of the patients and commands given, were standardised in a manual, and the responses achieved from the patients were registered according to a scale for each parameter.

### Results/conclusion

The results achieved by measuring closely the progress over time in these severely brain injured patients, were used for planning a realistic rehabilitation program. The method was found to be very practical in communications with the relatives of the patients, and with the other professionals involved. By decomposing the cognitive functions by this method using all the available possibilities for inputs, changes of cognitive functions mentioned could be registered. Even minimal cognitive improvements could be uncovered showing the advantages of this method compared to traditional clinical evaluations. Data for the eight patients are presented.

### References:

- *Giacino JT, Kezmaryk MA, DeLuca J, Cicerone KD. Monitoring rate of recovery to predict outcome in minimally-responsive patients. Arch Phys Med Rehabil 1991; 72: 897-901.*



## DIFFERENT PATTERNS OF “INNER CEREBRAL TRAUMA” AND A NEW CLASSIFICATION OF BRAIN INJURY

1. *G. Birbamer*, Prof., Klinikum Staffelsein, Staffelsein, Austria
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### Description:

The term “inner cerebral trauma” has been adopted to indicate a pattern of deep brain lesion that occurs frequently in closed head injury of the acceleration-deceleration typ. In patients with severe closed brain injury the lesions occur in the central region of the brain, the typical pathological pattern is characterized by multiple lesions in the corpus callosum, periventricular regions, semioval centre, basal ganglia, hippocampal area and brainstem.

Depending on the direction of traumatizing forces the pattern of lesions were subdivided in a “upper” and a “lower” inner cerebral trauma and a rotation trauma. The high sensitivity makes MR a valid method for documenting these lesions effectively.

### Methodology:

The study population includes 150 patients (112 male, 38 female), with a mean age of 24,2 years (5-69). Inclusions criteria were suspicion of inner cerebral Trauma on CCT or discrepancy of CCT-findings and clinical symptoms. Clinically, acute midbrain syndrome (MS) was present in 22 patients, prolonged MS in 25, apallic syndrome in 52 patients, and a post-apallic stage in 51 patients. All patients underwent a CCT examination in the acute stage, MR-imaging (1.5 T, Magnetom, Siemens Erlangen) was performed in 22 patients within one week after the accident, in 28 patients between one week and one month, in 60 patients within one month and one year and in 60 patients later than one year post-trauma.

### Conclusion:

From neuroradiological point of view we differentiate between linear external brain injury with coup and contre-coup lesion, linear internal brain injury, subdivided into upper and lower internal brain injury and a rotation trauma. Contrary to the diagnostic system of brain contusion and concussion, we differentiate four clinical categories of severity of brain injury. This new system of classification permits a rapid detailed diagnosis of brain injury and its sequelae and a more early establishment of prognosis.



## REMISSION-STAGES OF APALLIC SYNDROME

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### **Description:**

According to Gerstenbrand apallic syndrome is a state of „chronic“ decerebration following an acute or subacute cerebral trauma, with functional blocking of the cortical-subcortical, diencephalic and mesencephalic structures. The functional dysfunction allows us to consider the condition as reversible and therefore subject, in some cases to remission.

Acute mesencephalic syndrome following trauma or other conditions may develop into apallic syndrome characterized by disturbances of wakefulness. The patient is no longer conscious of himself or his surroundings and although he seems to be in a state of wakefulness he has developed a sleep-wakefulness cycle not regulated by the nyctohemeral cycle.

### **Methodology:**

The apallic syndrome can be differentiated between an initial stage, a transitional stage and the stage of remission including eight phases. The first four phases occur in a consistent sequence, the further four phases are influenced by local primary and secondary traumatic damages that depend on the direction as well as the intensity of the violence that the skull is exposed to.

The sign of the first phase during the course of remission is the subsidence of the coma vigilie including the beginning of a rhythm of sleeping times and waking states due to daytimes as well as making contact with the environment (focussing and following with the eyes) and the reduction of the motoric primitive shapes. This is followed by a Klüver-Bucy-Syndrome which also influenced the further two phases and turns into a Korsakow-Syndrome. This again is followed by an amnesic phase and a phase of a psycho-motoric syndrome. Local and diffuse brain damages of the first, second and third etiology as well as complications (contractures, ossifications etc) mark the defect stage.

### **Conclusion:**

The knowledge of the process of remission is important for the individual program of treatment as well as for the prognostic assessment.



## TRAUMATIC BRAIN INJURY AND “COME BACK TO LIFE”: A POSSIBLE TRANSITIONAL LIVING MODEL

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3. **M.E. Villa**, President of ARCO 92 ONLUS, Roma, Italy
4. **R. Formisano**, PHS, IRCCS Fondazione Santa Lucia, Roma, Italy

### Objectives:

1. Caregiver Educational Program before family reintegration.

The experience of a prolonged coma following a TBI is a catastrophic event for the patient, for his family and especially for the caregiver, who daily has to assist the patient.

Many voluntary's associations have been founded in order to face the difficulties existing in TBI treatment, but today only a small group of operators is involved in this very demanding and severe pathology.

The association A.R.CO. 92 (Association for the Rehabilitation of Comatose patients) consists of some relatives of TBI patients and specialists in Intensive Therapy, Neurology, Physical Therapy and Psychology, already involved in the treatment of comatose and post-comatose patients. The first aim of A.R.CO. 92 was the support of the severe brain-injured patient and his family in the different phases of the recovery, from the acute phase to the social and work reintegration. In fact brain-injured subjects are generally slow in movements, in speech, in making decisions and trend to lose partner and/or friends, up to social isolation, and the only person who finally remains close to the brain-injured subject is the caregiver.

Thus, it's very important to support psychologically the caretaker, in order to preserve the emotional energy he will need in the future to afford the physical and emotional efforts of rehabilitation treatment in the best way.

Aim of this study was to introduce the preliminary results of an educational program in a transitional living environment for the post-comatose patient and the caregiver, in order to prepare the final family, work, school and social reintegration.

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## **A COMPREHENSIVE, STANDARDIZED, DATA-DRIVEN NETWORK-BASED NEUROLOGIC REHABILITATION PROGRAM**

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3. **Paul J. Domitor**, PhD, Northwest Neuro Institute, Spokane, WA, USA

### Objectives:

1. Provide information on a standardized, data driven rehabilitation system for OT, PS, SLP, VR, etc.
2. Present visual "vital signs" for monitoring patient progress in all areas of neurologic rehabilitation.
3. Identify a mechanism for "virtual" staff conferencing and involvement of patient/family in the process.

The authors have developed a network based rehabilitation solution that delivers treatment protocols to doctors, therapists, payers and caregivers of patients suffering from traumatic brain injuries and neurologically related diseases, such as Multiple Sclerosis, strokes, Parkinson's and Alzheimer's. It creates coordinated care methodology, offering standardized treatment and consistency to multispecialty care teams, improving patient's quality of life, and creating measurable tools for assessing outcomes. Conversely, the current treatment is characterized by: "paper-driven" care planning, coordination and communication; non-standardized care protocols; arbitrary and subjective measures of patient progress leading to inconsistent applications by payers and providers. The forty treatment protocols address all treatment areas associated with neurological impairment. Disciplines include physical therapy, occupational therapy, speech therapy, behavioral health therapy, recreational and vocational rehabilitation. All treatment protocols provide for quantifiable performance measures for all areas of traditional rehabilitation, for example, gait, verbal memory, range of motion, cooking, motor skills, personal hygiene, etc. A unique approach to neurorehabilitation through an integrated system occurs that includes the following:

- A. A rehabilitation treatment program to assist providers, payers, patients and their families and that addresses all treatment areas associated with neurological impairment.
- B. Common databases for doctors, therapists, home health companies, rehabilitation hospitals, patients, family members and payers.
- C. Actuarial data to provide predictive models associated with more accurate initial treatment cost estimates as well as forming the basis for risk contracting.
- D. Increased productivity for providers and more efficient use of case manager time associated with reduced paperwork (estimated at 25-30%).

### References:

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## **BOTULINUM TOXIN TYPE A (BTX-A) IN THE TREATMENT OF UPPER LIMB SPASTICITY**

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Therapeutic intramuscular injections of BTX-A are a major advance in the treatment of focal dystonia and show promise in spasticity of different aetiology. We studied the efficacy and safety of Botulinum toxin A (BTX-A) injections in patients affected by upper limb spasticity, in an open labelled trial. We examined 27 patients, 13 cases affected by severe traumatic brain injury and 14 patients affected by vascular lesions. Fixed muscular contractures and articular calcifications were assumed as exclusion criteria from the trial. Upper limb muscles were injected in all subjects with BTX-A by means of an EMG needle electrode guidance, to improve the selectivity of treatment. On the whole, 43 injections were executed; 13 subjects received only 1 injection, 12 subjects were reinjected a second time and 2 subjects 3 times. The mean dose per session was 150 UI (Botox); the dose per muscle ranged from 25 to 100 UI. Outcome measures were: Modified Ashworth Scale (MAS) for grading muscle spasticity; joint angles measurements by means of a goniometer (range of movement, ROM); clinical evaluation of postural improvements, voluntary movements and changes in limb function. The mean follow-up was of 1 year. The clinical benefit started after 2-3 days and reached the peak in about 3 weeks. Improved nursing care and reduced disability were observed in all subjects. Improvements in MAS, joint ROM and clinical evaluation were observed in the vast majority of cases., but arm function improvement in activities of daily living were obtained in less cases. The pain arising from muscle spasms has been relieved by BTX-A treatment. The effects of a single injection were long-lasting in more than half cases. The treatment in the early phases of the muscular tone disorders seemed to be a critical factor and injection in distal muscles was more effective than in the proximal ones. These preliminary data show that BTX-A treatment is effective in reducing spasticity in selected patients with focal upper limb muscular tone disorders secondary to traumatic and vascular brain injuries.



## COMBINED USE OF FACES III AND DSSVF FOR A BETTER UNDERSTANDING OF BEHAVIORAL DYNAMICS OF TBI SUBJECT'S FAMILIES

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This experimental research is an attempt to prove the efficacy of the combined use of some investigation instruments for a comprehensive evaluation of families of brain injured patients.

In our Rehabilitation Center the family unit receives an early support, starting in the postacute phase and continuing until assessment of the final outcome. The family evaluation protocol includes a clinical interview during which the family unit and its behavioural dynamics are investigated, and the filling of a family data form where family and patient anamnestic profiles are recorded.

We have used the DSSVF projective test which enables to represent the family structural configuration and to anticipate possible changes in case of critical events; and Faces III which identifies family organization patterns from a systemic point of view and which, on the basis of three typologies, classifies families as "balanced", "intermediate", "extreme".

We investigated a sample of 10 couples (mother and father) whose son or daughter, with age ranging from 18 to 25 and living with his/her original family, suffered from impairments due to severe brain injury after a traffic accident occurred at least 1 to 4 years before. The tester did not know the family setting, so that we can speak of a "single-blind" test configuration. The results obtained with the combined use of Faces III and DSSVF confirm that it is possible to acquire in significantly shorter times what the rehabilitation team has learnt about the family in approximately two years of habitual contacts.

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## DYSPHAGIA IN TBI VS VASCULAR AND ANOXIC BRAIN INJURY

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Among brain injury disorders connected to or following coma, dysphagia is one of the most serious problems conditioning survival even during the acute stage.

This research was carried out in order to investigate the reliability of evaluation instruments used for a rational rehabilitation approach to every single dysphagic patient.

We report our observations in patients with severe brain injuries, and data regarding clinical functional evaluation, videofluorographic examination and functional evolution of swallowing from the beginning of the rehabilitation treatment until patient's discharge.

Two different scales, set up in our hospital (for the clinical functional aspect and for the videofluorographic examination, respectively) were used to describe the evolution of this disability.

76 subjects with age ranging from 17 to 60, affected by dysphagia after serious brain injuries, were tested: 48 with traumatic, 19 with vascular and 9 with anoxic etiology.

From a preliminar analysis of data it results that the best functional recovery is obtained in patients who suffered from a traumatic brain injury.

In subjects with sequelae of vascular insult, diet modifications were needed for longer periods.

In anoxic patients the long-term outcome of swallowing could be worse than in T.B.I. and vascular population.

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### ASSESSMENT OF DRAMATIZATION DIFFICULTIES IN A GROUP OF CHILDREN WITH TRAUMATIC BRAIN INJURY OUTCOMES

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#### Objectives:

1. To verify the ability of a group of children with traumatic brain injury outcomes to dramatize a short text, and to identify the difficulties involved.
2. To evaluate useful means of facilitation to induce positive changes in the children's ability to dramatize.

To a group of six children with traumatic brain injury outcomes, it was suggested to dramatize a short story. In order to evaluate the baseline and the self-organizational skills of the group, the initial performances were accomplished without any facilitation. Subsequently, various means of facilitation were provided.

All performances were recorded on videotape and then analyzed with the use of a specifically designed grid.

The same procedure was applied to a control group of six children, all of the same age, with no history of traumatic brain injury outcomes.

The study brought to the identification of considerable difficulties experienced by the children with head injury outcomes, when compared to the control group.

The observation grid resulted in an adequate tool to identify the means of facilitation that could effectively improve the group's short term performance.

Effective means of facilitation were considered useful to improve the children's performance in group activities and were recommended for use in school re-entry programs for individual children.

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## **LOCKED-IN SYNDROME: IMPROVEMENT IN THE PROGNOSIS IN SUBJECTS SUBMITTED TO AN EARLY INTENSIVE REHABILITATION**

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3. **Sergio Lotta**, MD, Ospedale G. Verdi, Villanova (Pc), Italy
4. **Anna Mazzucchi**, MD, Centro Cardinal Ferrari, Fontanellato (Pr), Italy

Objectives:

1. Locked-in syndrome.
2. Early rehabilitation.
3. Prognosis.

### **Introduction.**

In 1966 Plum and Posner (1) called "locked-in syndrome (LIS)" the neurologic condition associated with tetraplegia, anarthria, eye blinking and eyelid movement. Consciousness remains intact and the patient is able to communicate using eye blinking. The lesion is located in the ventral pons. The most common etiology of LIS is cerebrovascular disease (52%) followed by traumatic brain injury (31%). In the literature (3) the mortality rate is high (60%), mostly during the first four months after the morbid event (87%) and in the vascular group (67%). Pulmonary complications and extension of the brain stem lesion are the most frequent causes of death. It has been recently (2) reported a reduction of the mortality rate in acute LIS, attributable to an early beginning of the rehabilitation and to a more effective nursing care.

### **Materials and methods.**

A retrospective study has been led: it has been considered the evolution of 9 patients, hospitalized in our Centers, not in the same time, from 1996 until 2000, and submitted to an early intensive rehabilitative treatment. It has been evaluated the beginning objective conditions in the main districts (cranial nerves, trunk, limbs and bladder), the relative recovery and the clinical findings at the follow-up after the first year.

### **Results.**

At the beginning the 9 cases presented a classical LIS form, according to Bauer (3). Everyone has been submitted to an early rehabilitative treatment, with an average of 19 days after the morbid event, consisting in motricity, respiratory, swallow and speech training (4 sessions daily), besides the nursing care. Two patients did also occupational therapy, with the purpose to improve the superior limbs motricity and the ADL autonomy. In 4 cases it has been executed even a gaze training to improve the ocular movements, useful for the communication. During the first 3-6 months it has been reached this recovery of the motricity (according to Patterson's classification): good recovery in 1 case, moderate recovery in another, minimum recovery in 5 patients and



no recovery in other 2 subjects. Besides it has been noticed a very low mortality rate: only one case at the third year after the morbid event.

**Conclusions.**

The intensive and early rehabilitation care, begun within 19 days after the morbid event, has positively weighed upon the follow-up and has drastically reduced the mortality rate, that, as reported by several authors, was 60% about ten years ago.

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## MRI USING TURBO-PEPSI SEQUENCE: FAST DETECTION OF DIFFUSE AXONAL DAMAGE IN BRAIN INJURY

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3. **Gisela E. Hagberg**, PhD, Lab. of functional neuroimaging, Fondazione IRCCS S. Lucia, Roma, Italy
4. **Rita Formisano**, MD, PhD, Dpt. of Radiology, Fondazione IRCCS S. Lucia, Roma, Italy

### Objectives:

1. To assess sensitivity and specificity of the Turbo-PEPSI sequence in identifying foci of iron deposition associated to axonal injury

**Description:** Diffuse axonal injury, an important cause of morbidity in patients with traumatic brain injuries, is identified as multifocal hemorrhagic iron deposits in the white matter due to disruption of the penetrating blood vessels. T2\*-weighted MR images are sensitive in identifying the foci of iron deposition which often go undetected using conventional T1- and T2-weighted images alone. Turbo-PEPSI (TP), an echo-planar-imaging (EPI) sequence sensitive to magnetic field inhomogeneities, has been developed for functional neuroimaging studies (Posse et al, 1999). To our knowledge, this sequence has never been used for morphological imaging in the clinical setting. Our aim was to evaluate the utility of TP for detecting shearing injuries in post-traumatic patients.

**Methodology:** 10 post-traumatic patients were examined with a 1.5 T Vision scanner (Siemens, Erlangen) equipped with EPI gradients. Conventional spin-echo T1-T2-PD-weighted, gradient echo and TP T2\*-weighted axial-oblique images, covering the whole brain and parallel to the intercommissural line, were obtained. The sensitivity and specificity of TP was assessed and compared to the gradient echo sequence, assumed as “gold standard”. Lesion conspicuity and spatial resolution were also evaluated.

**Conclusion:** TP displayed a sensitivity and specificity similar to the gradient echo sequence. Although spatial resolution in the TP images (in-plane resolution: 4-9 mm<sup>2</sup>) was less than the gradient echo sequence, lesion conspicuity was higher. The results of this study suggest that TP is suitable for assessing post-traumatic patients and, in view of its higher speed relative to the conventional gradient echo, promises to be particularly helpful in uncooperative patients

### References:

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## A CASE OF SEMANTIC MEMORY LOSS AFTER TRAUMATIC BRAIN INJURY: NEUROPSYCHOLOGICAL STUDY AND REHABILITATION APPROACH

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3. *Emilia Imbornone*, PhD
4. *Riccardo Pignatti*, PhD

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Objectives:

1. Semantic loss analysis
2. Cognitive Rehabilitation

Detailed analysis of neuropsychological deficits is essential for planning cognitive rehabilitation. MA, a 28 years old male, was tested 6 months after traumatic brain injury. He showed severe amnesia and impairment in naming and identification of animals and objects. We studied his semantic memory deficit through a series of specifically designed tests, using both visual and verbal material. Stimuli belonged to living (animals, fruits, vegetables) and non-living (buildings, tools, clothing, vehicles, pieces of furniture) semantic categories. We assessed patient's knowledge of 'central' (i.e. the most representative) features of stimuli belonging to different semantic categories as well as his knowledge about 'general' and 'specific' features of the same stimuli. We asked 20 matched controls to rate the relevance of a series of distinctive features of different items to build the "central features questionnaire" (CFQ; 454 questions) and the "general and specific features questionnaire" (GSFQ; 793 questions). MA naming impairment was significantly greater for living (than for non-living) and animal (than non-animal) stimuli in all experimental tasks. Furthermore MA was significantly more impaired in answering questions related to visual features of animals versus non-animals (CFQ:  $p=0,029$ ), while no difference was found for functional questions (CFQ:  $p=0,297$ ). The same pattern of impairment was found for living versus non-living categories (CFQ: visual  $p=0,033$ ; functional  $p=0,071$ ).

These data suggest that recognition of natural items (particularly animals) is more based on visual attributes than on functional characteristics. According to these results, a specific rehabilitation program has been started: methods and results of cognitive training will be detailed.

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## NEUROREHABILITATION OF SEVERE TBI IN WESTERN-DENMARK

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Intensive neurorehabilitation is a new clinical discipline in Denmark, despite the fact that there are more than 150 neurologists and 50 neurosurgeons to serve the Danish population of 5.5 million. In Denmark, approximately 350-400 patients per year suffer from severe TBI (Glasgow coma score 3-9). Until recently the post-acute treatment of these patients has not been organised. In 1997 the Danish National Board of Health reviewed the area and suggested that all post-acute hospital-based rehabilitation of patients with severe TBI in Denmark should be centralised in 2 centres; one serving the population of Western Denmark (Hammel Neurocenter) and the other Eastern Denmark (Hvidovre Hospital, Copenhagen). Both centres will have nearly equal number of beds (30-40), will treat both children and adults and are closely connected to the local university department and research facilities. The 2 centres are connected to the neurosurgical centres, using the same treatment protocol and clinical scores. Clinical data will be collected into one common database covering the acute phase, the rehabilitation phase and several years of follow-up. Such a centralisation of the rehabilitation of all patients with severe TBI in a whole country is to our knowledge unique and offers excellent possibilities for development, education and research. Our paper will present how multidisciplinary hospital-based rehabilitation of patients with severe TBI are organised in Western Denmark. This will include presentation of our referral criteria, multidisciplinary treatment model, the use of different scoring systems and future research areas.



**REHABILITATION PROGRAM FOR CHILDREN AND ADOLESCENTS WITH TRAUMATIC BRAIN INJURY (TBI) WITHIN THE CONTEXT OF THE QUÉBEC PROVINCIAL NEUROTRAUMATOLOGY SERVICES CONTINUUM**

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Objectives:

1. To present the program offered to children and adolescents with traumatic brain injury (TBI), the different approaches and types of interventions, and the global context in which these services are provided.

The Québec Rehabilitation Institute (IRDPQ) is one of the most important rehabilitation centres in the Province of Québec (Canada). It holds a "university status" for its state-of-the-art expertise in rehabilitation and its training and research activities. The poster will present a bird's-eye-view of the rehabilitation program offered to children with traumatic brain injury (TBI). This program is based on the most recent practice and also on the Handicap Production Process (HPP) in its global, interdisciplinary and ecological approaches. The authors will present the 8 general objectives of the program and the different types of interventions and activities with TBI children. Special attention will be given to the school integration model, family reintegration, long-term follow-up and specific interventions for minor TBI children. The poster will also deal with the team's involvement in research and training and also how the program was evaluated. Finally, the poster will present this program within the context of the Québec Provincial Neurotraumatology Services Continuum that proposes a model starting at the prevention phase all the way through to the optimal social participation phase. Different documents and photographs will support the poster presentation.



## LONG TERM OUTCOMES OF MILD HEAD INJURY IN EARLY CHILDHOOD

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4. **D.M. Fergusson**, Professor, Christchurch Health and Development Study, Christchurch School of Medicine, Christchurch, New Zealand

### Objectives:

1. Evaluate longitudinal outcomes after mild head injury in childhood.
2. Evaluate the relationship between age of injury and outcomes.

Mild head injury is generally considered a frequently occurring but benign childhood event. Previous studies investigating potential cognitive and behavioural consequences have produced mixed findings and controversial outcomes, in part due to methodological issues. The present study used a longitudinal birth cohort (initiated in 1977) which permitted the use of a fully prospective design. Of a total cohort of 1129 children, 134 sought medical attention for a mild head injury with confirmed or suspected concussion occurring between birth and ten years of age. The children were grouped into those who received medical attention at an outpatient facility (n = 96) and those hospitalised, usually overnight for observation (n = 38), and were compared with the remainder of the cohort (n = 895). After controlling for a wide range of demographic, family and pre-injury characteristics, the mild head injury inpatient group but not the outpatient group displayed increased attentional and conduct difficulties, as rated by mothers and teachers. Difficulties were evident over 10-13 years in the complete inpatient sample and over 7-13 years in the 0-5 year inpatient subgroup. Similar changes in the 6-10 years inpatient subgroup did not persist after the inclusion of covariates, probably due to lack of power (n = 14). When evaluated at 14-16 years of age, a higher proportion of the inpatient children met the DSMIII-R criteria for Attention Deficit Disorder and Conduct Disorder. These findings on measures of attention and conduct strongly suggest that mild head injury in childhood may produce long term adverse outcomes.



## TRENDS IN HEAD INJURED PATIENTS EVOLUTION IN INTENSIVE CARE UNIT

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2. **J.L. Monfort**, Neurorradiologist, Bellvitge Hostpital, Barcelona, Spain
3. **M. Juncadella Puig**, Neuropsychologist, Bellvitge Hostpital, Barcelona, Spain
4. **J.L. Ventura**, Phisician Specialist of Intensive Care Unit, Bellvitge Hostpital, Barcelona, Spain

### Objectives:

To compare the outcome of head injured patients in ICU following the classical treatment compared with the "Lund therapy".

**Material and methods:** 71 head injured patients with CGS<9 were admitted to our ICU during two years(1998-1999). Age  $37\pm 17$  years. Mechanism of injury: 74 % motor vehicle, no gunshot wounds. Worst initial GCS: 3 in 6%, 4 in 17%, 5 in 20%, 6 in 25%, 7 in 17% and 8 in 15%. 81% were transferred from another hospital. ICP monitoring was used in 79%.

**Results:** They presented: 39% ICP > 20 and 49 % CPP < 60. The TCDB therapy index: 15 in 20%, 9 in 2%, 7 in 1%, 6 in 13%, 5 in 13%, 4 in 4% and  $\leq 3$  in 47%. 14% required craniotomy. ICU mortality was 16% and GCS at the ICU discharge: < 9 in 4%, 10 in 20%, 11 in 8%, 12 in 9%, 13 in 12%, 14 in 28% and 15 in 3%. Hospital mortality: 18%.

**Conclusions:** Though our mortality was higher than obtained with de "Lund therapy", was lower than in TCDB, Rosner group and the European Brain Injury Consortium. This lower mortality can be attributed to: the lower percentage in GCS 3 admitted to our ICU, the higher level of ICP monitor control in our group and the absence of gunshots.

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## SELFHHELP-GROUPS WITHIN A PC-INTRANET

*Roar Dalin*, Socialnetwork Adviser, Øverby Resource Center, Norway

Objectives:

1. Create social networks.
2. Improve social skills.

Øverby Resource Center is part of the National Specialeducation Supportsystem in Norway for children, young people and adults suffering from acquired brain injury (ABI).

Our main responsibility is primarily assessment and guidance/counselling to the communitybased supportingsystem. Our focus is on the educational field as part of the cognitive rehabilitation given to persons who have sustained an acquired brain injury.

Øverby Resource Center has, through this work, recognised the importance of helping the individual with ABI to have personal relations with others in a corresponding situation. The main objective is to offer an arena of social belonging where respect and dignity are the basic principles of the relationship. There are different factors that make it difficult to participate in ordinary selfhelpgroups for people with acquired brain injury. This group is a low-frequency group, Norway has a scattered population and the group has speech and language disturbances and reduced cognitive capacity.

In the light of this, we have established selfhelpgroups within a "PC-intra net" (First class) where only the participants have access (6-10 in each group). As far as we know it is only Stanford University who has done something similar, but including people with cronical illness.

**Factors of success:** Some physical meetings are necessary to get to know each other. Various levels of physical and cognitive functioning among the participants create advantages. They make the most of each other, the most disabled are stimulated to do their best and the best functioning get confirmation that they are capable.

The participants get the time they need to express themselves and to process what the others want to tell. All messages are automatically stored. The participants can join the group any time of the day (night).

What we have experienced is that the participants rate the social fellowship they are part of as most important. They tell that participating in the group has contributed to improved social skills, a strengthened selfconfidence, made them want to communicate more and has given them a stronger motivation for doing things on their own.

*References:*

- *Egil Larsen, Manager of Acquired brain damage Dep, Øverby Resource Centre*



## COMMUNITY BASED REHABILITATION SERVICES – COLLABORATION LEADING TO EFFECTIVE SERVICE DELIVERY

1. *JoAnne Davis*, B.A M.Ed., Brain Injury Services of Hamilton, Hamilton, Ontario, Canada
2. *Sarina Labonte*, B.A., RRP, Brain Injury Community ReEntry Niagara, St. Catharines, Ontario, Canada
3. *Alice Bellavance*, RPN, Brain Injury Services of Northern Ontario, Thunder Bay, Ontario, Canada
4. *Carol Williams*, MBA, Peel Halton Acquired Brain Injury Services, Mississauga, Ontario, Canada

### Objectives:

1. Outlining the collaborative framework for Provincial Planning and Development.
2. Overcoming barriers to service delivery in the community.
3. To describe the development of specialized community-based services.

This poster presentation describes current (Ontario, Canada) models of community-based rehabilitation services for individuals living with the effects of Acquired Brain Injury (ABI).

The framework for the discussion will be provided by an overview of the Network of Community Based Acquired Brain Injury Programs. This group is comprised of ten organizations funded by the Ontario Ministry of Health and Long Term Care to provide services, exclusively dedicated, to individuals who have sustained an ABI.

The development of specialized services including: transitional and life long living residential options, vocational re-entry and job coaching; leisure/recreational opportunities; supported independent living; respite; and options for individuals with complex challenges, will be described as they relate to the Provincial Planning Document, "The Continuum of Opportunity".

Regional differences in the province will be described, in terms of how they influence service design and delivery in individual member organizations.

Barriers to independence for people with acquired brain injuries, including substance abuse and dual diagnosis will be addressed. Strategies for overcoming these barriers in the community programs, including the use of behaviour analysis techniques will be discussed.

The range of community based, government funded, services available within Ontario, Canada provides a wealth of expertise and exemplifies the efficacy of community based rehabilitation in the enhancement of quality of life for individuals with an ABI.



## **WISCONSIN CARD SORTING TEST: A NEW GLOBAL SCORE, VALID FOR THE ASSESSMENT OF DYSEXECUTIVE SYNDROME IN HEAD-INJURED PATIENTS**

1. **Antonio De Tanti**, MD, Rehabilitation Centre Villa Beretta, Valduce Foundation, Como, Italy
2. **Maria G. Inzaghi**, Sp Th, Rehabilitation Centre Villa Beretta, Valduce Foundation, Como, Italy
3. **Marcella Laiacona**, MD, "S. Maugeri" Foundation, IRCCS, Rehabilitation Institute of Veruno, Division of Neurology, Neuropsychology Unit, Veruno, Italy
4. **Erminio Capitani**, MD, Clinic for Nervous Diseases, Milan University, San Paolo Hospital, Milano, Italy

### Objectives:

1. Assessment of Executive functions.
2. Proposal of a new measure for the WCST.

Wisconsin Card Sorting Test (WCST) is a neuropsychological tool useful for detecting frontal lobe dysfunction and for assessing the integrity of executive functions. Several scores and scoring dimensions are suggested by Heaton (1), but these procedures are complex and too fragmentary for a quick clinical judgement. We propose a new measure of global efficiency, the Global Score, that may be useful in identifying 'dysexecutive' patients in a concise and informative way (2). It estimates how many cards the subject actually used in excess of the minimum necessary to achieve all the categories that he sorted. It captures in a single score the combined information of four measures used by Heaton (Number of the Categories Completed, Number of Trials Administered, Percent Conceptual Level Responses and Total Number of Errors). The aim of the present study is to present normative values for this new measure and to verify its validity in pathological subjects with respect to the current measures. Norms were drawn from the performances of 205 healthy control subjects by means of evaluating the influence of age, education and gender through a covariance linear model. Thirteen head-injured patients were given the WCST and for each of them a Global Score was computed. The comparison of this new measure with the previous scoring procedures indicates that the global score is very sensitive despite its effortless calculation

We are confident that this measure yields a reliable judgement of the performance, satisfying the main query in clinical practice.

### References:

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- 2) Laiacona M, Inzaghi MG, De Tanti A, Capitani E. *Wisconsin Card Sorting Test: A new Global Score, with Italian norms, and its relationship with the Weigl Sorting Test*. *Neurol Sci*. in press



## **A MODEL OF COLLABORATION BETWEEN HOSPITALS AND COMMUNITY BASED SERVICE**

1. **Deborah Delorme**, Executive Director, Dale Brain Injury Services, London, Ontario, Canada
2. **Stella Bester**, Manager, ABI program, Hamilton Health Sciences Corporation, Hamilton, Ontario, Canada
3. **Cheryl Hartridge**, PhD, c. psych., Parkwood Hospital, Canada
4. **Patti Leonard**, Director of Neurosciences, Hamilton Health Sciences Corporation, Hamilton, Ontario, Canada

### Objectives:

1. Identify specific challenges in the service delivery continuum.
2. Identify specific solutions to challenges in the service delivery continuum.
3. Provide concrete recommendations for the development of service delivery systems.

Our poster presentation will directly address the congress objective of describing current models of rehabilitation programs serving those individuals living with an Acquired Brain Injury (ABI). Specifically, we will identify challenges and solutions to the development of an effective service delivery continuum.

We will discuss some of the system issues facing service providers including: impeded access to system entry/re-entry; limited range of services; poor service linkages; gaps in service; inadequate funding.

We then will demonstrate how networks of service providers in two Canadian communities forged hospital and community partnerships to meet the complex needs of people with an Acquired Brain Injury.

Finally, using the experience of these two communities, we will provide concrete recommendations for the development of a service delivery system that is personalized, comprehensive, seamless, and flexible.



## THE CONSEQUENCES OF ENCEPHALITIS

1. *Elaine Dowell*, National Coordinator, Encephalitis Support Group, Malton, UK
2. *Ava Easton*, BSc (Hons), Dip App S.S., The Encephalitis Support Group, Adult Support Services, York, UK
3. *Tom Solomon*, Lecturer in Neurology and Honorary Lecturer in Medical Microbiology and Tropical Medicine, University of Liverpool, Liverpool, UK

### Objectives:

1. To investigate the consequences of Encephalitis.
2. To investigate the impact of the consequences of Encephalitis on the quality of life of people affected and their carers.

### Description

Encephalitis is inflammation of the brain tissue, caused by a variety of viruses, including Herpes Simplex Virus. Untreated, the mortality rate is high, but with anti-viral and other supportive treatments, more patients are surviving. There is little data on the long term consequences of viral encephalitis for the patients and their family. We therefore studied the physical, cognitive, behavioural and social consequences of viral encephalitis.

### Methodology

A questionnaire was sent to all members of the UK charity, The Encephalitis Support Group, in January 2000.

Responses were returned for 400 (33%) of 1200 members (261 adults, 139 children). 99 (38%) adults and 33 (24%) children were diagnosed as Herpes Simplex Encephalitis.

Only 39 (28%) of children and 81 (31%) of adults were felt to have returned to a normal life.

74 (53%) children and 103 (39%) adults were receiving Disability Living Allowance.

41 (62%) of 66 children with epilepsy had a statement of special needs, compared with 20 (27%) of 73 with no epilepsy ( $P < 0.0001$ ).

158 (61%) adults had a fall in income and only 68 (34%) of 198 in employment before the illness were still employed.

In addition to physical and cognitive impairment, poor concentration, tiredness, mood swings, and frustration contributed to the disability.

### Conclusions

Survival from Encephalitis is associated with severe neuropsychiatric, behavioural and cognitive sequelae that have a marked impact on the life of the person affected and their carers.



## **INTENSIVE CARE NEUROREHABILITATION: AN INTEGRATED MODEL FOR SEVERELY BRAIN INJURED PATIENTS WITH AUTONOMIC DYSFUNCTIONS**

1. *Bernd Eifert*, MD PhD
2. *Petra Maurer*, MS Psychology  
Fachkrankenhaus Neresheim, Germany

### **Objectives:**

1. Identify unique characteristics of severely brain injured patients with autonomic dysfunction.
2. Describe a treatment concept for these patients.
3. Present outcome data.

**Description:** Severe brain injury can lead to profound autonomic dysfunction. So far those patients could be transferred from acute care to rehabilitation only after the conclusion of intensive care.

We describe the treatment concept of Fachkrankenhaus Neresheim (FKNe) for the early phase of neurorehabilitation, combining intensive care treatment and rehabilitative therapies. Also we present characteristics of these patients and outcome data.

**Methodology:** We described our patient profile and aspects of our treatment approach. Retrospectively we evaluated data of patients admitted to our clinic in 1999.

**Results:** Most patients present a combination of impaired motor and autonomic functions and consciousness. The majority needs intensive care medicine including respiratory therapy. The early integration of neurorehabilitative concepts in the intensive care setting is aimed at a regulation of the disturbed systems.

In 1999, we admitted 89 patients, on average 25 (3/10) days (median (min/max)) after the injury. The length of stay in FKNe was 97 (4/383) days. 89% of all patients were admitted in the intensive care unit. Of those 65% needed respiratory therapy. The average length of stay in intensive care was 21 days (4/184). Of those admitted with tetraplegia (n=59) 56% recovered. Severe disturbances of consciousness (coma, vegetative state, minimally conscious state) persisted in 10 out of 46 patients at time of discharge. Functional independence (FIM-Score) improved from 18 to 52 (median).

**Conclusion:** Severely brain injured patients with autonomic dysfunction need specialized intensive care treatment over a long period of time. Treatment in an integrated neurorehabilitative intensive care setting is promising.



## **EPIDEMIOLOGY OF SEVERE TRAUMATIC BRAIN INJURY IN MISSISSIPPI**

1. ***Domenic P. Esposito***, MD, FACS, Assistant Professor, Department of Neurosurgery, University of Mississippi Medical Center, Jackson, MS, USA
2. ***Ahmed Badr***, MD, FCCM, Assistant Professor, Director of Neurocritical Care, Department of Neurosurger, University of Mississippi Medical Center, Jackson, MS, USA

The State of Mississippi has the highest death rate from Traumatic Brain Injury in the United States. Whereas in the country at large there are approximately 22 deaths per 100,000 individuals per year in the State of Mississippi, this figure is approximately 32 deaths per 100,000 per year. Mississippi also has the highest national incidence of obesity, heart disease and diabetes. Only recently has a statewide trauma system been established. The following poster will analyze geographical considerations, premorbid conditions and lifestyles issues which may explain the increased number of deaths due to Traumatic Brain Injury.



**WHEN RESULTS EXCEED EXPECTANCY: MULTIDISCIPLINARY REHABILITATION APPROACH IN A CASE OF VERY SEVERE TRAUMATIC BRAIN INJURY WITH BASAL SKULL FRACTURES**

1. *Elisabetta Farina*, MD
2. *Leonora Chiavari*, PhT
3. *Emilia Imbornone*, PhD
4. *Claudio Mariani*, MD

Don Gnocchi Foundation, S. Maria Nascente IRCCS, Milano, Italy

Objectives:

1. Cognitive Rehabilitation.
2. Pharmacological management.

SG, a 37 years old male, suffered an accidental severe head trauma on March, 1999 (GCS: 7). Serial CT scan showed a large left temporal hematoma, multiple emorragic petechiae in midbrain, and multiple basal skull fractures. Post-traumatic coma lasted two weeks. SG was submitted to neurosurgical interventions for left subdural igroma and basal skull plastics. A replacement therapy was started for panhypopituitarism. We started cognitive rehabilitation on September, 1999. SG showed marked fluctuation in vigilance and attention, irritability, severe non-fluent aphasia with apraxic speech, left amaurosis, and right spastic hemiparesis. The first two months of rehabilitation was dedicated to speech therapy, and to improve sustained attention throughout computerized tasks, whose length was progressively increased (SG was unable to sustain attention for longer than 20 minutes at the beginning of the training). At the same time, family members were trained in behavioral approach to decrease irritability. On October, 26, 1999 the patient experienced an epileptic attack: carbamazepine at 600 mg/day was started. Improvement of vigilance and behavioral disturbances was noted. On November, 1999 we started also a training of residual abilities: visuospatial functions and, partially, calculation. SG progressively demonstrated increasing collaboration and communicative abilities, along with better participation in housework tasks and social activities. The last part of the training was dedicated to plan occupational activities based on procedural learning, which was showed to be fully preserved. At the same time, substitution therapy for panhypopituitarism was adjusted, further contributing to improvement of attention. We stress the importance of combined rehabilitation and pharmacological approach to improve prognosis of survivors of severe traumatic brain injury.

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## NEURO-OPHTHALMOLOGIC FINDINGS IN A REGIONAL TRAUMATIC BRAIN INJURY REHABILITATION UNIT

1. **Warren L. Felton III**, MD, McGuire VAMC & VCU/MCV, Richmond, VA, USA
2. **Marian L. Baxter**, RN, MS, MA, CRRN, McGuire VAMC, Richmond, VA, USA
3. **Tripti B. Jena**, MD, McGuire VAMC, Richmond, VA, USA
4. **Sayed W. Asad**, MD, VCU/MCV, Richmond, VA, USA

### Objectives:

1. To present the neuro-ophthalmologic findings of a regional brain injury rehabilitation unit.
2. To correlate these findings with standard brain injury scales.
3. To correlate these findings with risk factors for brain injury and compensatory strategies.

**Description:** Over a period of two years, 95 patients were admitted to the Brain Injury Rehabilitation Unit at the McGuire Veterans Affairs Medical Center, Richmond, Virginia, one of four lead centers, in the Department of Veterans Affairs, for the United States Department of Defense and Veterans Affairs Head Injury Project.

**Methodology:** All patients were screened by Physical Medicine and Rehabilitation Service staff for symptoms and signs of visual dysfunction related to trauma. Neuro-ophthalmologic examinations were performed on 21 patients, including assessment of visual acuity, color perception, pupil function, optic funduscopy, ocular motor function, visual fields, and higher cortical visual function. These findings were correlated with Glasgow Coma Scale, Rancho Los Amigos Scale, Functional Independence Measure, age, gender, neuroimaging (Head CT, MRI), source of injury, date of injury, compensatory strategies, social history including active duty vs. veteran, alcohol and substance abuse, previous history of traumatic brain injury or stroke, and discharge to home vs. nursing home.

### Conclusions:

1. Neuro-ophthalmologic sequelae of traumatic brain injury are common and include traumatic optic neuropathy, ocular motor palsies, visual field loss and higher cortical visual impairment.
2. Neuro-ophthalmologic abnormalities are more common in patients with severe brain injury.
3. Neuro-ophthalmologic sequelae impact functional outcome.

### References:

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## NEOCORTICAL VERY SLOW ELECTRICAL ACTIVITY AFTER THE LOCAL BRAIN INJURY: AN EXPERIMENTAL STEREOTAXIC STUDY IN RODENTS

*Igor V. Filippov*, Department Physiology and Biophysics, Yaroslavl State Medical Academy, Yaroslavl City, Russia

Objectives:

1. To study time course dynamic of the very slow electrical activity in neocortex after it local mechanical injury.
2. To compare the critical periods of these dynamical shifts with the previously documented morphological changes in neocortex.
3. To reveal the possible practical implications of the brain very slow electrical activity as a functional probe in brain injury.

**Introduction.** It was shown that brain spontaneous very slow electrical activity (VSEA) in the frequency range 0-0,5 Hz (previously known as “DC-shifts”) is the very sensitive neurophysiological method for the brain structures functional states study [1,2]. Unfortunately, this methodology was rarely applied to the brain injury research. Therefore, the present study is addressed to this topic.

**Methodology.** Experiments were conducted on 25 adult albino rats with chronically, stereotaxically implanted bipolar gold electrodes into the frontal cerebral cortex area. The implantation surgery procedure was regarded as the experimental model of the local mechanical brain injury. From this moment and up to 1 month after it (postinjury period) each animal have passed daily the registration of the neocortical VSEA. Statistical analysis was performed for all VSEA recordings.

**Results.** It was demonstrated that even local brain injury dramatically alter neocortical VSEA in compare to the normal control group of animals. These changes were presented by the occurrence of high amplitude (up to 3,5 mV) regular slow potential oscillations (with the periods 30-60 seconds and 1-3 minutes) in the neocortex. The dynamical changes (critical periods were: 2-3, 4-7, 8-10 and 11-14 days) of VSEA in postinjury period were positively correlated with previously documented [1,3,4] neuromorphological and biochemical responses of neocortical areas to the brain trauma.

**Conclusions.** The obtained experimental results suggest that the brain VSEA dynamics could be used as a sensitive functional probe in brain injury cases, since it significantly corresponds to the morpho-chemical changes in the brain tissue after it traumatic injury.

References:

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3. Maxwell W. et al. \ *Phil. Trans. Roy. Soc. London B*. 328 (#1250): 479-500; 1990.
4. Promyslov M. Sh. *Brain metabolism and it regulation during brain injury*. Moscow: Medicina, 1984 (in Russian).



## ERRONEOUS THERAPEUTIC STRATEGIES IN ORTHOPAEDIC MANAGEMENT OF INJURED PATIENTS WITH MAJOR NEUROLOGICAL DISORDERS

1. *E. Fiorio*, Ospedalino Koelliker, Torino, Italy
2. *F. De Masi*, Ospedalino Koelliker, Torino, Italy
3. *S. Fontolan*, Ospedalino Koelliker, Torino, Italy
4. *P. Pietrapiana*, Presidio Sanitario Ausiliatrice, Centro di neuroriabilitazione per gravi cerebrolesioni, Torino, Italy

In this paper we describe five clinical cases of young subjects with outcomes of severe neurological disabilities who also sustained traumatic extracranial injuries, particularly located in the lower limbs, directly involving the rehabilitation program.

We will illustrate, through a critical evaluation, why technical procedures not necessarily incorrect from the orthopaedic surgery point of view, will achieve poor results if carried out in particularly unusual clinical conditions.

In all our patients the concurrence of severe neurological disease influenced the therapeutic choices of orthopaedic surgery, with two kinds of errors: diagnostic or tactical/technical.

From the point of view of orthopaedic management, the therapeutic strategy was negatively influenced by either chronological or technical inadequate choices, solutions or procedures.

The severe neurological involvement often leads physicians to avoid prolonged and complex surgical procedures.

We think, however, that a correct diagnosis and adequate surgical strategy to major osteoarticular injuries in patients with brain or nervous pathological damages facilitates recovery and rehabilitation, and often are the most important requirements for an acceptable outcome.



## PSYCHOSOCIAL ADJUSTMENT AND EMPLOYMENT OUTCOME 5 AND 10 YEARS AFTER TBI

1. *Alexei Franulic*, MD, Mental Health Service, Hospital del Trabajador de Santiago, Chile
2. *Carmen Gloria Carbonell*, Psychologist, Mental Health Service, Hospital del Trabajador de Santiago, Chile
3. *Patricia Pinto*, Occupational Therapist, Occupational Therapy Service, Hospital del Trabajador de Santiago, Chile
4. *Isabel Sepulveda*, Occupational Therapist, Occupational Therapy Service, Hospital del Trabajador de Santiago, Chile

### Objectives:

1. Describe psychosocial and labor condition of patients 5 and 10 years after TBI.
2. To correlate labor situation with clinical and cognitive factors at the evaluation moment.

TBI continues to be an important cause of death and disability. Behavioral changes, both emotional and psychological alterations after TBI, are long-lasting and limiting. Return to work has been considered a good indicator of the general adaptation of the individual after TBI. We have designed a study at the Hospital del Trabajador in Santiago, Chile, to evaluate the psycho-pathological and social condition, with emphasis on the employment state of the patients, 5 and 10 years after TBI. Patients currently with TBI and accompanying pathologies such as spinal cord injuries, amputations and other physical limitations, were excluded. The patients were evaluated by a psychologist and an occupational therapist by means of clinical interviews, by applying Disability Rating Scale, Anxiety and Hamilton Depression Scale and by Neurobehavioural Rating Scale (NRS-29). The evaluation of labor conditions was done by an occupational therapist conducting a labor interview of the patient or family member, and when possible, by the immediate supervisor at the workplace.

In the 10-year study group, 54 patients were evaluated, of which, 66% maintain some work activity, 36,5% of them at the same company. 60% remain married. The 5-year study group consists of 47 patients, of whom 53% are actively working and 66% remain married. Memory alterations (70%) and irritability (50%) are reported as the main hindrances at work. A complete analysis of the results will be presented.



## EFFICACY OF ATTENTION TRAINING PERFORMED IN SEVERE TRAUMATIC BRAIN INJURY (TBI) SUBJECTS

1. **Masako Fujii**, PhD, Professor, Division of Nursing, Hamamatsu University School of Medicine, Hamamatsu, Japan
2. **Yoko Matusuoka**, Division of Nursing, Hamamatsu University School of Medicine, Hamamatsu, Japan
3. **Haruko Shikimori**, PhD, Professor, Christopher Collage of Nursing, Hamamatsu, Japan

### Objectives

1. The purpose of this study was to determine efficacy of attention training in severe traumatic brain injury in adults.
2. To determine usefulness of the Brain Wave-R and Test of Every Attention.

Five TBI subjects were trained using modified version of the attention training in the Brain Wave-R (Malia et al. 1997. Pro-ed). The drill was revised for TMB subjects to be able to excise alone or with family member at home.

Our modified drill is focused on attention training and consists of 4 exercises (No. 1-4). Each exercise was taken 5 days a week and repeated for 3 weeks. The drill was used for total 12 weeks (3 weeks 4 exercises) by each subject at home. Their training was supported by their families, mainly their mothers or spouses.

The efficacy of the trainings was assessed by comparing the data before and after the each trainings, using Test of Everyday Attention (TEA, Robertson et al. 1994. Thomas Valley Test Company), which are considered to be sensitive to the attentional deficit of TBI (Ponsford, et al. 1995), consisted of 8 items, involving several attentional factors. Three TBI subjects whose 12 weeks training have been finished showed improved TEA mean points. The results are suggested that the attention training of 12 weeks have a efficacy to approach to the normal or standard range of everyday attention in TBI subjects and that Brain Wave-R and TEA were well organized in attention training.

### Reference:

- Ponsford. J., Sloan, S and Snow, P.: *Traumatic Brain Injury: Rehabilitation for Everyday Adaptive Living*. Psychology Press. UK. 1995.



## A SCREENING PROCEDURE FOR IDENTIFYING MILD BRAIN INJURY VICTIMS WHO ARE AT RISK OF DEVELOPPING PERISTENT SYMPTOMS

1. **Michelle Gadoury**, Société de l'assurance automobile du Québec, Québec City, Québec, Canada
2. **Chantal Bourque**, Institut de réadaptation en déficience physique de Québec-Site Cardinal-Villeneuve, Québec City, Québec, Canada
3. **Suzanne Bouillé**, Centre de réadaptation Interval, Québec City, Québec, Canada
4. **Raymond Fortin**, Centre de réadaptation Marie-Enfant de l'hôpital Ste-Justine, Québec City, Québec, Canada

### Objectives:

1. To present a screening procedure for mild TBI patients.
2. To present a prognostic assessment system to identify those at risk of developing chronic symptoms.
3. To present preliminary results on the use of the procedure.

The Société de l'assurance automobile du Québec has developed screening procedures allowing the early identification of road accident victims who sustained a mild brain injury and are at risk of having their condition become chronic (around 15%), with a view to quickly refer to appropriate rehabilitation services so as to prevent complications and promote their optimal recovery.

A screening guide was drawn up on the basis of a review of the literature on the subject, an assessment of practices, a Quebec-wide consensus on diagnostic and prognostic criteria and a clinical trial. The guide proposes assessment tools, a decision-making sequence and a four-step process:

- Identification of potential brain injury victims showing clinical signs of brain injury
- Medical diagnosis and prognosis (level of injury severity)
- Prognosis for recovery and identification of risk factors:
  - in connection with the individual: pre-morbid factors (personality styles, features of adaptive mechanisms, presence of stress factors) and reactive factors (initial or late response, postconcussion symptoms, anxiety or depression)
  - in connection with the family and the living environment: lack of support, poor interaction by surrounding people
- Choice of therapy

The guide has been in use in 28 health care facilities since April 1, 2000. Preliminary results will be presented.

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## **HOSPITAL TO HOME TO SCHOOL & BEYOND - PAEDIATRIC ACQUIRED BRAIN INJURY COMMUNITY OUTREACH PROGRAM (PABICOP)**

1. **Jane Gillett**, MD, FRCPC, Paediatric Neurologist, Medical Director, Paediatric Acquired Brain Injury Community Outreach Program, London, Ontario, Canada
2. **Joy Sommerfreund**, M.Ed, OTr, Manager of Lifespan, Thames Valley Children's Centre, London, Ontario, Canada
3. **Ellen Rosen**, RN, MScN, Manager Children's Services, Children's Hospital of Western Ontario, London, Ontario, Canada

### Objectives:

1. To outline an innovative program for providing community based support to children/youth with acquired brain injuries and their families.
2. To present illustrative case studies which highlight the successful functioning of the program and need for further expansion.

The Paediatric Acquired Brain Injury Community Outreach Program (PABICOP) is an innovative program that was designed for the purpose of providing community based support to children/youth with acquired brain injuries and their families, in five counties of South Western Ontario - Canada.

There are eighty new moderate to severe acquired brain injuries per year that are admitted to the Children's Hospital of Western Ontario (CHWO). There are a further 100-150 admitted each year with mild to moderate injuries. Half of these admissions live in the five counties of South Western Ontario that has a provincially funded community outreach program (PABICOP). Furthermore, there is a prevalence rate of over 400/year that need ongoing management. Many of these "old" prior ABI injuries also qualify for the services of PABICOP provided they live in the catchment area.

Currently, PABICOP actively follows 270 patients with 60 who are "inactive" but who can re-activate services when needed. The program averages 4-7 new referrals per month.

The purpose of PABICOP is to provide education and support to existing services and care providers, so as to enable the community to provide the child and family with the supports they may need. This program attempts to do this by forging a partnership with the child or adolescent's community in an effort to address the needs of the individuals and groups involved, including therapists, service providers, school personnel, and family members. The aim of the program is to provide education about the general and specific effects of ABI on the child/youth's development, as well as to assist in crisis intervention, community re-integration, school liaison, behaviour management and transitional issues. Professional peer to peer consultation is also available and medical



care and consultation is provided through clinics, including clinics held with the child/youth's community. This is essential as many of the children/youth in Ontario reside in rural communities in which access to traditional professional rehabilitation services is restricted, and most schools and recreational facilities have little knowledge of the immediate and long term effects of ABI on the child/youth's functioning.

The poster presentation will detail how the program functions, the roles of the professionals involved and illustrate with case studies. It is hoped that this program will be permitted to expand provincially and to expand locally to include greater behaviour management support and research.

## POSTERS



## **SUPPORTING FAMILIES AND SCHOOLS OF CHILDREN AND ADOLESCENTS WITH AN ACQUIRED BRAIN INJURY: THE ROLE OF THE SCHOOL LIAISON**

*Janice Gray*, MA Pediatric Acquired Brain Injury Outreach Program, Children's Hospital of Western Ontario

### Objectives:

1. To illustrate the need for proactive communication with the school regarding the 'new' needs of the child with an ABI.
2. To present case study examples which highlight successful reintegration through the provision of support, education, and communication for families and schools.

Statistics show that in the Province of Ontario, Canada (total population-11,000,000) over 500 new students per year sustain a severe acquired brain injury (ABI). Estimates of prevalence of pediatric ABI's is closer to 10,000 including mild and moderate acquired brain injuries. Unfortunately, with even a mild ABI, there can often be life-long learning problems - in spite of outwardly 'normal' appearance. Effectively then, schools become the largest service provider for children and adolescents with brain injuries (Savage & Wolcott, 1995). For many families, their child's injury exposes them, for the first time, to the special education process-negotiating getting academic assistance and having their child identified as having special needs. In the province of Ontario, Canada, this process, when unfamiliar, can be quite complex. In addition, this comes at a time when families are already highly stressed and often struggling to regain some semblance of a normal life post injury. For their part, schools are often unaware of the issues and needs of the child with an ABI. These issues may be transient or permanent, are often subtle and easily missed. As well, school funded placements for educational assistants and resource help are typically made in September, while an ABI can occur anytime.

This poster will present case examples to illustrate the role of the School Liaison within a unique pediatric rehabilitation program.

Examples will highlight the need for having a dedicated person to

- 1) proactively liaise with the family and school regarding home schooling, gradual re-entry, classroom modifications, safety issues, etc.
- 2) help the family navigate the 'system' regarding the Identification and Review process.
- 3) provide school personnel general and specific information about the nature and impact of ABI on students (cognitively, behaviourally, socially, emotionally).
- 4) function as a 'mediator' between home and school, in situations where perceptions have become biased or adversarial.



- 5) help to monitor students as they make developmental transitions from grade to grade or from elementary to secondary school.

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## DEFICIT UNAWARENESS IN ACQUIRED BRAIN INJURY

1. *Anna Green*, Executive Director, HILL Program, Hamilton, Ontario, Canada
2. *Demetrio LaBella*, Occupational Therapist, HILL Program, Hamilton, Ontario, Canada

### Objectives:

1. To explore deficit unawareness in four young adult clients (ages 19 - 22) at their residential treatment facility in Hamilton, Ontario.
2. To examine the hypothesis that client's pre-morbid value system may be the most vulnerable to deficit unawareness in ABI.

Historically, disorders of self-awareness after acquired brain injury (ABI) have been poorly understood and poorly managed in rehabilitation. In general, individuals with more severe and extensive neuropsychological deficits demonstrate the least awareness of deficits and frequently, they continue to underestimate or deny deficits, despite repeated feedback many years after their injury. It is uncertain whether deficit unawareness results from poor insight, which in turn is a consequence of injury-mediated brain dysfunction, whether it is a psychological defence against the recognition of impairments and disabilities, or whether it is a combination of both. Despite the differing views, it is largely accepted that awareness of deficits is crucial to rehabilitation success. Although further research is required, disorders of self-awareness in ABI are beginning to be better understood. As more knowledge of how distinct regions of the brain integrate thinking and feeling emerges, an appreciation of how different lesions produce deficit unawareness can be gained. Consideration of pre-morbid methods of coping helps ascertain to what degree these methods reflect non-defensive versus defensive approaches to coping with partial awareness of deficits. Understanding and measuring the complex disturbances of self-awareness and how these disturbances may change over time, will likely lead to important observations in neuropsychological rehabilitation and improve the effectiveness of treatment in ABI. The purpose of this research is to explore deficit unawareness in individuals after they have sustained a severe acquired brain injury (GCS 3-8). More specifically, the objectives of this study are as follows. First, to use a qualitative research design of cross-case analysis to explore deficit unawareness in four young adult clients (ages 19-22) at their residential treatment facility in Hamilton, Ontario. Second, to examine the hypothesis that clients' pre-morbid value system may be the most vulnerable to deficit unawareness in ABI. Third, to postulate that a highly intuitive, non-confrontational approach, designed to facilitate the client's ability to cope with natural environmental feedback, will optimize awareness of deficits. Finally, Goal Attainment Scaling (GAS) will be utilized to measure engagement in rehabilitation, which these authors believe is in direct correlation with increased awareness of deficits. As this research is in its early stages, preliminary findings will be presented.



## EXERCISE TOLERANCE, QUADRICEPS STRENGTH AND FATIGUABILITY, AND FUNCTIONAL ABILITY AFTER RECENT BRAIN INJURY

1. **R.J. Greenwood**, RNRU, Homerton Hospital, London, UK
2. **A. Bateman**, Department of Health Sciences, University of East London, UK
3. **O.M. Scott**, Department of Health Sciences, University of East London, UK

### Objectives:

1. To establish the extent of detraining and weakness within 6 months of TBI.
2. To investigate the relationships between (1) and functional independence.

**Method:** Aerobic capacity (VO<sub>2</sub> peak) was measured using direct breath-by-breath analysis of expired gases during incremental exercise testing on a cycle ergometer. Quadriceps maximum isometric voluntary contraction (MIVC) and fatiguability were measured using a torque chair and superimposed electrical stimulation. Functional independence and mobility assessment of patients included the Barthel Index, Berg Balance Scale, and Rivermead Mobility Index (RMI).

**Results:** Patients were moderately disabled (Barthel 14/20, Berg 38/56, RMI 9/15) and their VO<sub>2</sub> peak was  $23 \pm 1.8$  ml min<sup>-1</sup> kg<sup>-1</sup>, mean  $\pm$  SEM (62% of predicted normal). Quadriceps MIVC values of  $121 \pm 10$  Nm and  $79 \pm 9$  Nm contrasted with control peak torques of  $243 \pm 14$  Nm and  $220 \pm 15$  Nm for stronger and weaker legs respectively [F(3,72) = 38.2, p < 0.001]. There was no apparent difference in fatiguability. There were significant correlations ( $r > 0.5$ , p < 0.05) between oxygen uptake and functional independence and mobility measures.

**Conclusion:** Impaired exercise capacity and muscle strength are to be expected with reduced activity and mobility. These values provide a baseline from which to investigate the impact of training in this patient group.

This study received local ethical committee approval and was supported by North Thames Regional Health Authority.

### References:

- *Bateman A, Culpan F J, Pickering A D et al. A randomised control trial of aerobic training on rehabilitation outcomes after recent severe brain injury. Arch Phys Med Rehab (in press)*



## **HEADWAY - DEVELOPING COMMUNICATION AND RELATIONSHIPS WITH MINIMALLY COMMUNICATIVE SURVIVORS OF BRAIN INJURY**

1. *Helen Gunson*, Care Officer
2. *Rita Rees*  
Headway, Bristol, UK

### Objectives:

1. To describe the unique service provided by Headway Bristol, UK. for adults severely disabled and minimally communicative or 'locked in' as a result of a traumatic brain injury (TBI).

This group of individuals is very poorly provided for in the community and often has very little life experience outside of their family or nursing home. With the increasing ability of medical science to save lives it is society's moral obligation to ensure that these lives have quality. Our goal is to provide a service that establishes a social community these individuals can participate in, supports rehabilitation and offers sensory stimulation.

This is a very challenging, person intensive day. Two members of staff are responsible for organising the day and we have a dedicated group of volunteers who have a rich base of experience. We have six attenders ranging in physical and communication abilities hence methods of communication and activities we do are tailored specifically to each one. Having not known the attenders prior to their TBI, we are able to accept and meet the attenders where they are, without comparison to their previous live. This does not mean we do not acknowledge their past, but it gives the attenders and us the fresh start they do not experience with family and friends.

Time and patience are the two most important resources available to us. These resources, combined with the absence of pressure to attain time-limited goals, enable us to support attenders in areas of rehabilitation without undue pressure and judgements of success or failure. As a result of this we have observed attenders develop new skills and build on existing ones.



**COURSE AND PROGNOSIS AFTER BRAIN INJURY. INITIAL EXPERIENCES OF A PRACTICAL CHART FOR DESCRIPTION OF PATIENT INDEPENDENCE, TO BE USED IN INTERDISCIPLINARY TEAMWORK**

1. *Stefan Hagstadius*, PhD

2. *Astrid Ohlsson*, MD

Department of rehabilitation medicine, Kristianstad general hospital, Kristianstad, Sweden

Objectives:

1. Develop a chart for description of patient independence, easily understood by all involved.
2. Improve team-communication.
3. Clarify status, priorities and goals at a given point in time.

**Introduction.** There is general agreement that a team approach is vital in brain injury rehabilitation. Teamwork leads to a more consistent goal-oriented approach and better continuity. It is less certain, however, with what accuracy a team formulates patient status, goals and priorities. In order to facilitate this, we have developed a chart to be used during team conferences, describing the course of rehabilitation in terms of the patients' current independence level. Seven variables of "freedom" are used, reflecting the different domains of the team members.

**Aims.** To develop a chart, easily understood by all involved; improve team-communication; clarify goals, status and priorities at a given point in time; clarify when to activate the next link in the rehabilitation chain.

**Methods.** The chart is divided into 5 levels, from 1: total dependence to 5, total independence. Within each level, there are 6 steps, allowing for registration of development within that level. The seven variables mapped on the 5-level continuum are: biological freedom (physician/nurse), freedom of movement (physiotherapist), freedom of thought (neuropsychologist), freedom of speech (speech pathologist), freedom of action (occupational therapist), emotional freedom (neuropsychologist) and social freedom (councillor).

**Results and conclusions.** The chart holds promise as an overall team measure and illustration of the patients' current independence level and its development. It is a good illustration of necessary treatment priorities, and facilitates goal formation. For the chart to be useful, it is, however of crucial importance that the criteria of the freedom variables, for each independence level, are meticulously formulated.



## PHARMACOLOGICAL TREATMENT OF COGNITIVE DYSFUNCTION AFTER BRAIN INJURY. EFFECTS OF AN ACETYLCHOLINE-ESTERASE INHIBITOR

1. *Stefan Hagstadius*, PhD, neuropsychologist

2. *Ionela Terme*, MD

Department of rehabilitation medicine, Kristianstad general hospital, Kristianstad, Sweden

Objectives:

1. Investigate whether anticholine-esterase inhibitor treatment improves cognition after brain injury.
2. If so, are the effects similar in all patients, or are there individual patterns.

Introduction. Problems with memory, attention and concentration are common, if not axiomatic after TBI as well as after other types of brain injury. Cognitive training can, to some extent, alleviate such problems, but not eliminate them. There are indications that pharmacological treatment may be an effective complement to conventional training. Memory improvement has been reported in single cases of TBI after treatment with an anticholine-esterase inhibitor, previously used in Alzheimer's disease.

Patients and design. Six post-acute patients, three with traumatic brain injury, two with herpes encephalitis and one with anoxic brain injury, were treated with an anticholine-esterase inhibitor and investigated at an unmedicated baseline occasion, and after 8, 16 and 24 weeks of treatment. During the first eight weeks, the patients received a dosis of 5 mg daily, and thereafter, 10 mg daily.

Methods. Working memory, perceptual speed and concentration, cognitive flexibility, simultaneous capacity and visual search were investigated at each measurement occasion, with conventional neuropsychological methods.

Results and conclusions. All patients showed treatment effects on cognition, but individual patterns and dose-relations were seen, possibly related to injury severity. The most marked treatment-effects were seen in working memory, perceptual speed and simultaneous capacity. Only minor effects were seen in the anoxia patient. This type of pharmacological treatment may be of importance to some patients with brain injury, but it remains to be defined at what stage in the recovery process it is most beneficial, and if there are long-standing effects.



## COMMUNITY RE-ENTRY FOLLOWING MILD, MODERATE AND SEVERE BRAIN INJURY AMONGST 97 SCHOOL-AGED CHILDREN

1. **Carol A. Hawley**, Senior Research Fellow, University of Warwick, Coventry, UK
2. **Anthony B. Ward**, Consultant in Rehabilitation Medicine, North Staffordshire Rehabilitation Centre, Stoke-on-Trent, UK
3. **Andrew Magnay**, Consultant in Paediatric Intensive Care, City General Hospital, Stoke-on-Trent, UK
4. **Julie Long**, Rehabilitation Co-Ordinator, North Staffordshire Rehabilitation Centre, Stoke-on-Trent, UK

### Objectives:

1. To examine community re-entry, in terms of cognitive, educational and social outcomes, following brain injury in children.
2. To identify characteristics of children after brain injury and the problems they report compared with a control group of uninjured children.
3. To carry out a survey of teachers of injured and control children to evaluate educational performance and needs.

Recent research has shown that children with moderate or severe head injuries have many residual deficits (1, 2).

Despite such research there remains a lack of services for head-injured children, and there is inadequate provision for head injured children returning to mainstream schooling (3). Our study aimed to identify the extent and nature of the unmet needs of brain injured children, the problems faced by them and their families, and the role of school-teachers in producing a good or poor classroom performance.

The study group was identified utilising a regional Brain Injury Register of all children admitted with a brain injury between 1993 and 1998. 97 children (66% male), aged 5 - 15 years at injury, and their parents, as well as 31 control children (58% male) and their parents, were interviewed and assessed.

Time since injury ranged from 6 months to 6 years. They were followed-up after 12 months when 34% of the injured children were less than 18 months post-injury. Injury severity: 47 mild, 17 moderate, 29 severe and 4 unknown severity.

Parents were most concerned about their child's behaviour (58%), temper (61%), headaches (65%), memory (44%), concentration (59%), and difficulties with learning (39%). Few children had received any rehabilitation or therapy. Problems relating to school and learning were frequently reported (72% of those at school), yet schools were not always aware of the brain injury or were unsympathetic (23.5%). Only 12% of schools provided specific educational help.

Control children reported far fewer problems (Mean of 5.5/control compared to 11.2/injured child).



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3. Jones, A., and Johnson, D.A. (1994) *A study of the educational provision for head injured children*. *British Journal of Special Education*, 21: 113-117.



## A POSTAL FOLLOW-UP OF MILD, MODERATE AND SEVERE BRAIN INJURY AMONGST 525 CHILDREN IN NORTH STAFFORDSHIRE

1. **Carol A. Hawley**, Senior Research Fellow, University of Warwick, Coventry, UK
2. **Anthony B. Ward**, Consultant in Rehabilitation Medicine, North Staffordshire Rehabilitation Centre, Stoke-on-Trent, UK
3. **Andrew Magnay**, Consultant in Paediatric Intensive Care, City General Hospital, Stoke-on-Trent, UK
4. **Julie Long**, Rehabilitation Co-Ordinator, North Staffordshire Rehabilitation Centre, Stoke-on-Trent, UK

### Objectives:

1. To utilise a regional Brain Injury Register to follow-up all children admitted to hospital in North Staffordshire with a brain injury.
2. To identify the extent and nature of sequelae following brain injury 1-6 years post-injury amongst school-aged children.

Brain injury in children is of major concern for both families and health professionals (1). Studies of children with moderate and severe brain injuries have shown that cognitive and behavioural problems persist and often evolve over time (2), however there is little information about how children fare following mild brain injuries. The population of children forming the study group was identified utilising a comprehensive Brain Injury Register of all children admitted to North Staffordshire Hospital NHS Trust with a brain injury between January 1993 and December 1998. A postal questionnaire was designed and piloted, then sent to the parents of all children on the Register aged between 5 and 15 years at the time of the injury. 525 parents replied. 69.3% of the brain injured children were male. At the time of the postal follow-up the children ranged from under 1 year post injury (103 children (20%)) to 6 years post injury (57 children (11%)). Most children (419) had suffered a mild brain injury, 53 moderate, and 53 severe. At discharge 30% of parents denied receiving any information on post-injury symptoms. Clinical follow-up was limited, and specialist rehabilitation rarely provided. Statistically significant differences were observed between the mild and the moderate/severe groups for cognitive, social, emotional and mobility problems. Problems with behaviour and keeping up with school work caused particular concern for parents, and even years later, children with mild injuries were just as likely as more severely injured children to suffer from headaches and get into trouble at school.

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## **HYPERBARIC OXYGEN TREATMENT IN A PORTABLE CHAMBER FOR PATIENTS WITH COGNITIVE IMPAIRMENT AFTER MECHANICAL AND/OR NEUROTOXIC INJURY TO THE BRAIN**

1. *Gunnar Heuser*, MD, PhD
  2. *Olga Aguilera*, MD
  3. *Sylvia A. Heuser*, MA
- Neuromed and NeuroTox Associates, Agoura Hills, CA, USA

### Objectives:

1. Study brain injury with spect scan.
2. Study effect of hyperbaric oxygen treatment on SPECT in brain injured patients.

**Introduction** - It is now well known and accepted that even a mild concussion can lead to severe and at times progressive cognitive impairment, even with increased risk for Alzheimer's disease (1). It is also known that seizure disorders can develop, usually with a delay. It is less well known that concussion can impair the blood brain barrier and increase vulnerability to a neurotoxic chemical insult which in turn can result in impairment of cognitive/memory functions.

In recent years we have documented impaired brain function with SPECT brain scans (2) and correlated them with neuropsychological evaluations. We have also used SPECT to assess treatment results, especially after treatment with hyperbaric oxygen (HBO).

**Experimental design** - For this study patients were treated for one hour daily for 10 consecutive days at 1.3 ATA in 27% oxygen in a portable chamber.

**Results** - This poster shows three-dimensional color displays of SPECT before and after HBO. It also shows the results of a "TOVA" test (3) which measures attention deficit and reaction times before and after HBO treatments. Both SPECT and TOVA showed significant improvement.

**Discussion** - We propose that HBO be used in a portable chamber as therapy for brain injured patients and that SPECT and TOVA be used to monitor treatment results.

Treatment in a portable chamber at 1.3 ATA and approximately 27% oxygen is much less expensive than "regular" HBO at higher ATA and with 100% oxygen. It favorably compares with treatment in "regular" HBO units.

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## RETURN TO COMPETITIVE WRESTLING AFTER TRAUMATIC BRAIN INJURY

1. **Joseph E. Hornyak**, IV, MD, Asst. professor of PM+R in Pediatrics, Medical College of Ohio, Dept PM+R, Toledo, OH, USA
2. **Mara Vucich**, DO, Resident in PM+R in Pediatrics, Medical College of Ohio, Dept PM+R, Toledo, OH, USA

### Objectives:

1. Report two cases of severe TBI that returned to competitive wrestling.
2. Review the literature on return to sport after TBI.
3. Determine when one should return to competitive sports after a severe TBI.

Returning to competitive sport after traumatic brain injury is possible. However, the athlete's performance is likely to be greatly decreased and their chance of injury increased. We present two cases of high school wrestlers who were ranked at the state level and after suffering a severe traumatic brain injury were able to return to wrestling within six months. Unfortunately, they were no longer competitive at the same level and within one year from injury had retired. A review of the current literature on return to sport after traumatic brain injury is presented. There are guidelines for returning to sport after a mild brain injury. However, the literature is sparse when referring to return to competitive sport after a severe brain injury. These cases illustrate the consequences of returning to competitive wrestling after suffering from a severe traumatic brain injury. A discussion of the decision making process for whom and when one should return to sport is included.

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## ARE WISCONSIN CARD SORTING TEST AND WEIGL TEST SENSITIVE TO THE SAME PSYCHOLOGICAL ABILITIES?

1. **Maria G. Inzaghi**, Sp Th, Rehabilitation Centre Villa Beretta, Valduce Foundation, Como, Italy
2. **Antonio De Tanti**, MD, Rehabilitation Centre Villa Beretta, Valduce Foundation, Como, Italy
3. **Erminio Capitani**, MD, Clinic for Nervous Diseases, Milan University, San Paolo Hospital, Milano, Italy
4. **Marcella Laiacona**, MD, "S. Maugeri" Foundation, IRCCS, Rehabilitation Institute of Veruno, Division of Neurology, Neuropsychology Unit, Veruno, Italy

### Objectives:

1. Assessment of Executive functions in TBI.
2. Cross-validation of psychometrics tools.

The Wisconsin Card Sorting Test (WCST) (1) and the Weigl Test (WT) (2) are both used for the assessment of abstract reasoning. However, these two neuropsychological sorting tools have not been cross-validated and we do not know to what an extent they are tapping the same psychological abilities. In this study we analysed the correlation between the WCST and the WT in normal subjects and in head-injured patients. Moreover, focusing on the pathological sample, we studied their relationship with other widely used attentional tasks. 205 healthy control subjects and 48 head-injured patients participated in the study. Besides the WCST and the WT, patients were given visual-manual Reaction Times (basic and go/no-go) and the Digit Cancellation Test. On normal sample we calculated correlation and agreement between the WCST and the WT. The correlation was significant ( $r = 0.202$ ,  $p < .001$ ), but it shows only a moderate overlapping between these tests, and the performances were discrepant in some subjects. (3) Looking at the pathological sample, we studied the correlation between all the five tests. The correlation between the WCST and the WT was weak ( $r = 0.269$ ,  $p < .10$ ). The WT shows a slight association with the other tasks ( $r = 0.328$ ,  $p < .05$  and  $r = 0.283$ ,  $p < .10$  with the Digit Cancellation Test and basic Reaction Times test respectively). Moreover, 78% of patients judged pathological on the WCST were above the pathology threshold on the WT. In conclusion, also in the pathological sample, our results show that the two sorting tests are sensitive to different psychological abilities.

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## EARLY TREATMENT OF SURVIVING PATIENTS WITH PENETRANT HEAD INJURIES DURING THE WAR IN CROATIA

1. **Davor Janculjak**, Osijek University Hospital, Department of Neurology, Osijek, Croatia
2. **Silva Soldo-Butkovic**, Osijek University Hospital, Department of Neurology, Osijek, Croatia
3. **Bosko Barac**, Osijek University Hospital, Department of Neurology, Osijek, Croatia
4. **Bruno Splavski**, Osijek University Hospital, Department of Neurosurgery, Osijek, Croatia

### Objectives:

1. We analyzed the acute phase of hospital treatment of the surviving patients with penetrant head injuries during the war in Croatia (1991-5).

A group of 39 patients (37 males and 2 females, 31 civilians and 8 soldiers, mean age 29 +/- 9 years) were hospitalized at the departments of surgery and neurosurgery in the Osijek University Hospital, Croatia, for bullet, shrapnel or explosive wounds. Mean time of transportation from a wounding site to the hospital was about 80 minutes (range 10 to 245 minutes) for 25 patients where that kind of data were available. The mean patients' Glasgow Coma Score on admission was 7.6. We found following pattern of brain injuries with the CT diagnostic examination: intracerebral hematoma (in 18 patients), metal and bone particles (14), brain edema (11), subdural hematoma (7), and epidural hematoma (1). Only 3 patients were not operated. Early postoperative brain complications were reported as follows: hydrocephalus (15), meningitis (2) and brain abscess (1). Other complications included superficial wound infections of scalp and adjacent regions (4 patients) and one case of septicemia. In 3 patients convulsions occurred within 30 days of hospitalization.

Expeditious and comprehensive early treatment of patients who survived penetrant head injuries resulted in a relatively small number of postoperative complications in our cohort.



## **A MODEL TO EVALUATE THE EFFECTIVENESS OF COMMUNITY BASED SERVICES IN ONTARIO FOR ADULTS WHO HAVE ACQUIRED BRAIN INJURIES**

**Jane Johnston**, BNSc, MPA (in Progress) Director, Regional Community Brain Injury Services, Kingston, Ontario, Canada

Objectives:

1. To outline the rationale for the development of an evaluation model.
2. To describe the process involved in developing the model.
3. To describe the evaluation model.

Approximately 21 million dollars of annualized funding is approved by the Ontario (Canada) Ministry of Health and Long Term Care for the services provided by 10 not-for-profit programs to approximately 1000 clients and their families. The programs work with clients toward improved quality of life with full community participation.

Arising from government deficits and the increasing demand for accountability, there are new and intense pressures to demonstrate program effectiveness. Ministry of Health Funding and Accountability Guidelines indicate that program service plans should reflect the evaluation of service effectiveness. The Ministry of Health does not provide guidelines for evaluating effectiveness. The community acquired brain injury programs lack approved budgets for service and program evaluation.

The programs require an evaluation model that is well grounded in theory, informed about the political context, practical and meaningful to program personnel, policymakers and funders alike and able to contribute to ongoing program improvement.

Seven executive directors of the community programs and one Ministry of Health and Long Term Care official were surveyed about the meaning and logistics of service and program evaluation in community acquired brain injury service delivery. Based on their responses which were well supported in the literature, the evaluation model presented incorporates the logic of the programs with consideration of service and program effectiveness from six perspectives: the client perspective, the family perspective, the program's internal processes, the program's financial stability and efficiency, the perspective of the program staff and the perspective of the community.



## THE FUNCTIONAL OUTCOME PROFILE: COMPREHENSIVE TRACKING OF FUNCTIONAL CONSEQUENCES OF ACQUIRED BRAIN INJURY

1. **Michael Joschko**, PhD, Queen Alexandra Centre for Children's Health, Victoria, British Columbia, Canada
2. **Ronald W. Skelton**, PhD, Psychology, University of Victoria, Victoria, British Columbia, Canada

### Objectives:

1. Describe the Functional Outcome Profile for use in tracking changes in day-to day problems, abilities, and functional independence in older adolescents and adults with acquired brain injury.
2. Discuss and demonstrate the impact of acquired brain injury on family, close friends, or caregivers.

This presentation describes the measurement of the day-to-day consequences of acquired brain injury on older adolescents and adults (persons with brain injury - PBI), as well as on their families or caregivers. The Functional Outcome Profile (FOP) was developed at the University of Victoria with support from the Insurance Corporation of British Columbia. The FOP quantifies a person's level of functioning and concerns over a wide spectrum of areas including motor, language, social interaction, self-care and domestic skills, independence in the community, maladaptive behaviour, cognition and executive functioning, emotional state and energy level, health concerns, activities (work and play), pain, medications and drug use, family and sexual relationships, insight, and satisfaction with life.

FOP ratings are based on interviews with PBI and self-selected proxy raters. Therefore, the FOP addresses concerns about the accuracy of ratings provided by individuals with significant cognitive impairments and quantifies the impact of current functioning and concerns on the PBI and on family members, close friends or caregivers ("FAMILY").

The FOP provides a profile rather than a few summary scores typical of many other outcome measures. This profile is graphically presented in a way that easily allows clinicians to see the areas of concern for both the individual and the proxy rater. The presentation will describe, for a group of 25 PBI-"FAMILY" pairs, individual differences, self-other reliability, sensitivity to changes over time, and the importance of assessing brain injury outcome on family and friends, as well as on the person with brain injury.



## USE OF SPEED PROCESSING INDEX (WAIS III) IN TRAUMATIC BRAIN INJURY PATIENTS

1. *M. Juncadella Puig*, Neuropsychologist
  2. *C. Soriano*, Neuropsychologist
  3. *G. Escartin*, Neuropsychologist
  4. *L. Corral*, MD
- Ciutat Sanitaria i Universitaria de Bellvitge, Barcelona, Spain

### Objectives:

1. To determine if the speed processing index (Wais III) discriminates better than others neuropsychological tests.
2. To examine whether these tests discriminate equally according to severity of injury, by measuring posttraumatic amnesia.

### Introduction

The slowing down of information processing is characteristically one of the most frequent and persistent neuropsychological dysfunctions associated with traumatic brain injury patients.

### Methods

23 TBI patients (Age x 25'96, SD 6'95, schooling x 11'17, SD 3'10 ). A control group consisted of 19 subjects (Age x 25'89 SD 11'04, schooling x 11'11 SD 2'45). The Glasgow Coma Scale was considered moderate to severe, and the traumatic coma data bank was 2.

The neuropsychological assessment was carried out a year after the accident; the Pasat version G, Trail Making Test, the Stroop test and the speed information processing index Wais III

### Results

A logistic Regression analysis was used to identify the best predictors of patients and control group. Although all the variables obtained from the TBI and the control group were significantly different with a selection forward stepwise, the variable of speed processing was only included in the final model. This model classified correctly 69,6% traumatic patients and 73,7% of the group control (Xicadrado  $X = 15,805$   $p < 0,0005$ ;  $-2 \text{ II} = 42,038$ ). A linear regression analysis was carried out to study which variable discriminated better according to the severity of the injury, using a selection forward stepwise the final model only included the pasat 1 variable.

### Conclusions

The speed of information processing index (Wais III) was the test that best discriminated between brain injury and controls. The test that best discriminated the



severity of injury in relation to posttraumatic amnesia was PASAT serie 1.

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## NEUROPSYCHOLOGICAL STUDY AND QUALITY OF LIFE IN PATIENTS WITH ACOA AND WHO HAD UNDERGONE EITHER CLIPPING OR EMBOLIZATION TREATMENT

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  2. **M. Petro**, Neuropsychologist
  3. **A. de Miquel**, PhD, Neuroradiology
  4. **F. Rubio**, PhD, Neurology
- Ciutat Sanitaria i Universitaria de Bellvitge, Barcelona, Spain

### Objectives:

1. To measure the cognitive deficits and quality of life of these patients following the treatment that had been carried out.

### Method

The study consisted of 25 patients, randomly selected, and who had all suffered subarachnoid hemorrhage (SAH) due to ruptured cerebral aneurysm. 12 patients had undergone clipping. (Age x 49,92, sd 9,45; schooling x 8,33 sd 9,08). The other 13 patients underwent embolization (Age x 46'08, SD 12'93 schooling x 9'92 SD 4'05). The severity of the subarachnoid hemorrhage was similar in both groups. A neuropsychological study was carried out as from the initial year of treatment. The tests utilized were the Stroop test, Trail Making test, speed information processing index and working memory index (Wais III), Rey verbal learning test, verbal fluency, and the quality of life questionnaire (SF-36).

### Results

No significant differences were detected, using the U Mann-Whitney Test, between groups (clipping and embolization) with reference to the tests. However, a significant difference was detected between groups in the quality of life questionnaire. Physical function, (U=30 p=0.030), Physical role (U=21 p=0.005), vitality (U=30,5 p=0.030), standardized physical component scale (U=28 p=0,021).

### Conclusions

The type of the treatment did not significantly affect the results of the cognitive tests studied. The patients who had undergone embolization treatment had a worse perception of their health in general, above all in aspects related to physical health and vitality.

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POSTERS



## FEASIBILITY AND RELIABILITY OF ICDH-2 BETA-2 IN EVALUATING THE FUNCTIONING OF TRAUMATIC BRAIN INJURY (TBI) PATIENTS

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3. **H.T. Alaranta**, MD, PhD, Assoc. Prof., Käpylä Rehabilitation Centre, Helsinki, Finland
4. **J.O. Kivekäs**, managing director, Insurance Rehabilitation Association, Helsinki, Finland

### Objectives:

1. To assess the feasibility of ICDH-2 Beta-2 in evaluating the functioning of TBI patients from various aspects.
2. To assess the reliability of ICDH-2 Beta-2 in evaluating the functioning of TBI patients.

ICDH-2 (International Classification of Functioning and Disability, WHO 1999) classifies functional states associated with health conditions. "Functioning" and "disability" are umbrella terms covering the dimensions of body functions (b) and structure (s), activities (a), and participation (p). Environmental factors (e) form a part of the classification.

The material of the study consisted of 128 written records of 20 consecutive TBI patients rehabilitated in the Käpylä Rehabilitation Centre in 1999. The information of the functioning of the patients was extracted from the documents by two independent raters using the ICDH-2 checklist containing 125 two-level codes.

The mean number of two-level codes for each case was 61. The most frequent codes were found in the chapters of mental functions (b), structure of the nervous system and structures related to movement (s), activities of learning/applying knowledge and performing tasks/major life activities (a), participation in education and work/employment (p), and environmental systems and policies (e). The average time taken to code one case was 97 minutes. For a simple measure of inter-rater reliability, 39 one-level codes (chapter codes) were derived from the 125 two-level codes. The mean agreement between the raters in one-level codes was 91 % (range 55 - 100 % in the chapters).

ICDH-2 proved to be successful in illustrating the functioning of TBI patients from various aspects. The simple measure of inter-rater reliability was high. However, in clinical practice using ICDH-2 in detail would be time consuming. "An ICDH-2 TBI-checklist" consisting of specially tailored subset of codes might be a useful tool for quality assurance in evaluating the functioning of TBI patients.

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## VESICO-URETHRAL DYSFUNCTION IN COMATOSE PATIENTS

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2. **Maurizio Colombo**, MD, Urology Unit A.S.O. S.Croce, Cuneo, Italy
3. **Donatella Giraud**, Therapist, Rehabilitation Department A.S.L. 15, Cuneo, Italy
4. **Maurizio Cutellè**, MD, Rehabilitation Department A.S.L. 15, Cuneo, Italy

### Objectives:

1. Evaluation of micturition problems in comatose patients.
2. Evaluation of the influence of lateralisation of cerebral lesions above micturition problems.

The cerebral cortex is involved in coordinating micturition but there is little knowledge on specific evolutionary higher brain regions. The precise identification of the anatomical structures involved in micturition can contribute to a better understanding of the control of micturition and the development of therapeutic models. It was demonstrated (Blok 1998) that there is a specific nucleus in the pontine tegmentum responsible for the control of micturition and that the cortical and pontine micturition sites are predominantly on the right side. The micturition reflex is preserved in many patients with disturbed consciousness, but not in all patients in comatose state. The present study aims to investigate whether cerebral lesions in persistent vegetative state patients have an effect on patterns of micturition disorders. Patients admitted to the Rehabilitation Department of the A.S.L. 15 (Cuneo, Italy) with persistent vegetative state were admitted to the study. All patients (4 males and 2 females, aged from 20 to 35 years) urinated spontaneously as soon as the indwelling catheter was removed, and no residual urine was found on three or more postmicturition catheterisations. The urodynamics data showed complete bladder emptying and detrusor-sphincter synergy; the number included in this study is limited to demonstrate a correlation between lateralisation of lesions and urodynamic patterns.

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## COGNITIVE CORRELATES OF ATTENTIONAL FAILURES IN SEVERE TRAUMATIC BRAIN INJURY

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2. **A.-S. El Ahmadi**, UFR Psychologie, Université de Provence, France
3. **C. Cabanot-Sarrau**, Centre Hospitalier du Pays d'Aix en Provence, France

### Objectives:

1. Outline the behavioral components of brain injury and possible therapeutic approaches (7).
2. Describe treatment options and indications for use in the treatment of brain injury (18).

Abstract -- Slips of action may appear in everyday life of healthy people. These slips may be due to attentional failures, and they happened more frequently in populations with brain damages, especially in a severe Traumatic Brain Injury (TBI) group with frontal lobes lesions. This study aims at presenting some tasks governed by types of attention and their correlations with the brain damage severity, in order to select more relevant rehabilitation strategies. Conventional attention (switching, selective and sustained) tests were administered: Wisconsin Card Sorting Test, Stroop, Arithmetic Wais-R subtest and Digit Spans. All the tests showed great altered performances just after the stroke and a progressive recovery for some. Spans and Stroop are the most strongly related measures to persistent attentional deficits following TBI. The results are discussed in relation to the patients complaints and their life difficulties. Our discussion provides ideas on neuropsychological rehabilitation strategy.

### References:

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## MANAGEMENT OF PROBLEM BEHAVIOURS IN PERSONS WITH SEVERE ANTEGRADE AMNESIA USING IMPLICIT LEARNING PROCEDURES

1. *Carolyn M. Lemsky*, PhD, ABPP/ABCN
2. *Rachel J. Greenwood*
3. *Nicole Armstrong*

Community Head Injury Resource Services of Toronto, Ontario, Canada

### Objectives:

1. Demonstrate the usefulness of an errorless learning approach in persons with severe antegrade amnesia.
2. Demonstrate implementation of errorless learning by paraprofessionals in a community-based residential program.
3. Demonstrate long-term maintenance of treatment gains.

Persons living with severe antegrade amnesia often present with anxiety, depressed mood, restlessness, agitation and aggression. When hippocampal function is impaired, operant learning is disturbed, while classical conditioning may occur in a normal manner. This paper presents case studies of two persons whose community placements were at risk because of aggression, and refusal to bathe as well as wandering (case 1) and excessive demands for food (case 2). Both cases were male adults more than five years after anoxic brain injury resulting from cardiac arrest. The use of implicit learning techniques and planning productive daily routines reduced or eliminated the need for other interventions and improved adjustment. The paper will review management procedures used and the techniques required for implementation in an open, community group home environment staffed by paraprofessional carriers. Emphasis will be placed management of staff members' fear of clients' behaviours, method of selection of routines sustainable in the open home environment and staff education, which were essential to program success.

### Results:

Case 1: Aggression was reduced from daily to less than once per month, bathing increased from 20% to 96% over six months of treatment. Continued improvement including self-initiation of the routine 25%, of the time and generalization to family home on visits at two year follow-up.

Case 2: Showers increased from 30%, to daily. Continuing improvement is observed at four month follow-up. Routines to decrease requests for snacks are in development. Body weight will be presented as outcome.



## APPROACHES TO THE MANAGEMENT OF CONFABULATION

1. *Susan Lepore*, O.T.R.
  2. *Walter S. Stobaugh*, L.I.C.S.W.
  3. *Jeffrey S. Smigielski*, PhD, L.P.
- Mayo Foundation, Rochester, MN, USA

### Objectives:

1. To be able to describe the three levels of awareness of confabulation.
2. To be able to identify two techniques in the treatment of persistent confabulation.

Confabulation has been described as a tendency to give false accounts of past events, without awareness or deceptive intent (Sohlberg, M. & Ehlhardt, L., 1998). The clinical management of this problem in patients with brain injury can be challenging and frustrating. We describe procedures utilized effectively in the treatment of a series of individuals demonstrating persistent confabulation tendencies, in the context of post acute rehabilitation following brain injury. Utilizing a conceptual model described by DeLuca (1992) that postulates three levels of awareness of confabulation (intellectual, emerging, and anticipatory awareness), we describe specific techniques and procedures employed and their application within a team context. Implementation of these procedures within a post acute comprehensive-integrated group treatment program is presented; utilization of these techniques within a less intense and predominantly individualized treatment paradigm is also discussed. Variations and adaptations of the original treatment approach in differing patient contexts are described. The linkage of treatment for confabulation and memory compensation strategies is discussed. Specific methods of feedback from treatment staff as well as patient peer group members are presented. The critical importance of education for family for follow through and continuity is emphasized. Outcome information is described and follow up data is included. The outcomes in these cases provide support for the clinical utility and effectiveness of an organized and theoretically based approach to the treatment of this difficult condition.

### References:

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2. *DeLuca, J. Rehabilitation of confabulation: The issue of unawareness of deficit. Neuro Rehabilitation, 1992;2 (3):23-30.*



## COMMUNITY-BASED TRAUMA DATABASE AS A TOOL FOR IMPROVING QUALITY OF CARE AFTER HEAD INJURY

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  2. *Moshe Michaelson*, MD
  3. *Eran Tal-Or*, MD
  4. *Feinsod Moshe*, MD
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### Objectives:

1. Analysis of specific groups at higher risks for morbidity including relationships to referrals policy and severity of head injury.

**Introduction:** The first step of describing characteristics and outcome of head injured patients through different management stages was started in 1984 in regional level-I-TC (I-TC) with referrals from 10 regional hospitals. Since 1995 we are collecting data on all trauma admissions of our I-TC. The current analysis is targeted at finding the specific groups at higher risks for morbidity including relationships to referrals policy and severity of head injury.

**Methods:** Data from the trauma registry on all our acute trauma patients hospitalized during the years 1997-9 (9859 patients) was compared with cohort of patients of 1995-6 (6450 patients). Analyzing the specific group of patients with head injury (1652 and 1084 respectively) and using logistic regression (SPSS, version-9 software package) to extract the treatment process which might benefit from quality intervention. Specific tests including CHAID and Cluster modules are used to group the patients.

**Main results:** Of the current cohort 14% (415 patients) were referred from other hospitals compared with 43% of patients with head injury. Injuries were significantly more severe in the referral group and mortality was significantly higher (6.8% vs. 2%). Only in the subgroup of minimal injury, the difference in mortality is not statistically significant. Brain injury was significantly prevalent as the cause of death in referrals (68% vs. 27%).

**Conclusions:** Patients referred to I-TC are different as they have a higher mortality. This special group should be discussed separately when describing the population of a TC to minimize bias (especially when it comprises more than 10% of the cohort). The Additional findings extracted from statistical analysis of successive cohorts of patients treated during 1995-99 will be discussed. We also warrant a special attention for these patients in the admitting area due to the high risk of complications.



### THE USE OF NAMES IN EVOKING COGNITIVE P300 RESPONSES: IMPLICATIONS FOR PREDICTING OUTCOMES IN PATIENTS WITH BRAIN INJURY

1. **Henry L. Lew**, MD, PhD, VA Palo Alto Health Care System and Stanford University Medical Center, Palo Alto, CA, USA
2. **Elaine S. Date**, MD, VA Palo Alto Health Care System and Stanford University Medical Center, Palo Alto, CA, USA
3. **Rose Salerno**, RN, VA Palo Alto Health Care System, Palo Alto, CA, USA
4. **Simon F.T. Tang**, MD, Chang Gung Memorial Hospital, Taipei, Taiwan

#### Objectives:

1. Compare name-evoked and tone-evoked differences in the P300 response.
2. Discuss these findings and their implications to neuropsychological and functional outcome measures.

Compared to other electrophysiologic measures, the cognitive P300 response has substantial merit in predicting outcomes in brain injury because it is a reflection of cognitive processing. Traditionally, researchers have used tones to generate the P300 response (Yingling, Hosobuchi and Harrington, 1990). However, musicians and some others have no tone-evoked P300 response. Therefore, using tones to elicit P300 response may lead to false predictions. Speech, on the other hand, is an innately valid stimulus for eliciting cognitive responses (Lew, Chmier, Jerger, Pomerantz and Jerger, 1997). We have experimented with a single word, "mommy", to generate the P300 response, and the results appeared promising, as shown in a recent study (Lew, Slimp, Price, Massagli and Robinson, 1999). To take this experiment to another level, we upgraded our instrumentation to record the subjects' names, and presented them as the eliciting stimuli. Results from 20 normals showed that the subjects' names generated significantly larger P300 responses than tones. We are also actively recruiting patients with traumatic brain injury into our study, in order to correlate electrophysiologic findings with neuropsychological data, and their functional outcomes (Glasgow Outcome Scale-Extended; Wilson, Pettigrew and Teasdale, 1998).

#### References:

- Lew, H., Chmiel, R., Jerger, J., Pomerantz, J.R. and Jerger, S. (1997) *Electrophysiologic indices of Stroop and Garner interference reveal linguistic influences in auditory and visual processing. J Am Acad Audiol*, 8, 104-118.
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- Yingling, C.D., Hosobuchi, Y. and Harrington, M. (1990). *P300 as a predictor of recovery from coma. Lancet*, 336, 873.

## **BRAIN INJURY PREVENTION PROGRAMS IN THE UNITED STATES**

1. *Elizabeth Lock*, BA, Hope Network Rehabilitation Services, Grand Rapids, MI, USA
2. *Paula Dempsey*, M.O. Ed., Hope Network Rehabilitation Services, East Lansing, MI, USA

### Objectives:

1. Provide a summary of prevention programs offered in the state of Michigan, United States of America.
2. Provide resources to communities around the world to increase knowledge of available prevention programs and provide methods of establishing prevention activities in their own community.
3. Increase knowledge of safety programs available and resources to initiate programs.

This poster presentation will introduce attendees to five (5) prevention efforts currently conducted in the state of Michigan, United States of America. Each effort will be described in terms of its target audience, its safety statistics, its program structure, resources, benefits and goals.

### The following efforts will be covered on the poster presentation:

1. Buckle Up Car Seat Check Program - This program was established in 1996 by the National Safe Kids Campaign. Events are scheduled by local Safe Kids coalitions. Car seats are checked by trained inspectors for correct installation and fit. Unsafe car seats are removed and replaced with a model that facilitates the safety of the child.
2. HeadSmart Program - This program was established in 1992 in part by the Brain Injury Associations. It provides educators with the tools for presentations, community events and supplemental materials. Programs offerings also include prevention of violence, choices for the adolescent, and parenting.
3. Concussion Palm Cards - The concussion palm card records the grades of concussion and management recommendations. Provided to athletic directors, these cards will reduce the chances of athletes returning to competitive sports before they should and possibly sustaining a second concussion that puts them at even greater risk.
4. Soccer Headers. Soccer is the fastest growing team sport in the United States. It is currently the only popular kid's sport in which head protection is not required. The Header is a sleek padded headband that is lighter than a baseball cap. Worn properly, the Header has demonstrated to reduce the stress associated with head blows to the brain by 50%.



5. Bike Rodeo - Children bring their bikes to this event where bike safety and the importance of wearing a helmet is incorporated into the obstacle course activities. The main focus is to increase the awareness of parents and children regarding the importance of wearing a bike helmet while cycling.

Handouts will be provided to include a contact name and a first step facts sheet.

*References:*

- *Child Passengers at Risk in America: A National Study of Car Seat Misuse. National Safe Kids Campaign. Pamphlet. Washington, DC. February 1999.*
- *Brain Injury Association of Michigan. Newsletter. Volume 20, No.1, May 2000. Volume 20, No.2. Brighton, Michigan, USA. September 2000.*
- *Headers from Soccer Docs. Soccer Docs. Pamphlet. www.soccerdocs.com.*
- *HeadSmart Neighbors: Guidelines for the Community. Mary-Garret Bodel, M.Ed., MSW. Alexandria, Virginia, USA. 1999.*



## THE DIRECT CURRENT POTENTIAL AND THE FORECAST OF NEURO-REHABILITATION AFTER TBI

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2. *V.M. Shklovsky*

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Recently much attention has been paid to restoration of functions after brain catastrophes (TBI, stroke, neurosurgery and others). Thus we estimate how grave imparity is, what is its clinics, how long the coma lasted and how soon rehabilitation started. Methods of functional diagnostics occupy one of the leading positions in stating the dynamics and forecast of motion and higher mental functions (HMF) restorations after TBI. For this purpose alongside with CT and MRI, EEG and EP, and USDG the Centre of Neurorehabilitation applies the method of Direct Current Potential (DC).

**Goal.** To assess brain metabolic reserves and thus to forecast restoration of HMF including speech, after TBI.

**Object.** 30 patients (28 men and 2 women at the age from 10 to 52) with injured dominant hemisphere, with aphasic disorders and the right side hemiparesis as a result of TBI that occurred 1-3 years before. All patients passed through 44 days long neurorehabilitation at the Moscow Centre of Speech Pathology and Neurorehabilitation.

**Methods.** The DC was registered with local "Neuroenergon-2" at the beginning and at the end of the course. The patients were monitored with speech backing. The results were compared with neurological status and neuropsychological tests. The DC method has obvious merits since it is noninvasive, quick, simple and without camera data registration.

**Results.** Almost all the tested demonstrated decrease in brain energy expenses in both hemispheres (76 %) or asymmetry with decreased tested parameters in the injured left dominant hemisphere (24 %). The patients who had speech contact with operator showed expressed increase in energy expenses in the left parieto-temporalis (54 %) and demonstrated registered improvement in speech and other HMF in the end of the course.

**Conclusions.** DC can be used as a forecast significant method for brain reserves diagnostics, for forecast of HMF restoration and for neuro correction in TBI patients.



## EXECUTIVE FUNCTIONS AND MEMORY STRATEGIES IN A TRAUMATIC BRAIN INJURED POPULATION

1. **William MacAllister**, MS, VA Puget Sound Health, Lakewood, WA, USA
2. **Rex A. Bierley**, PhD, DVHIP Palo Alto VA HCS, Palo Alto, CA, USA
3. **Mary Rosner**, DVHIP Walter Reed Army Medical Center, Washington, DC, USA
4. **Elaine S. Date**, MD, DVHIP Palo Alto VAHCS, Palo Alto, CA, USA

### Objectives:

1. Examine the relations between executive functions and memory strategies.
2. Discuss the theoretical implications of these findings.

Executive functions, typically associated with the frontal lobes, include abilities such as planning and organization. Prior research has demonstrated that organizational strategies are an effective means of maximizing the amount of information remembered. Semantic clustering, the active organization of to-be-recalled items according to their common semantic features, is the most effective means of maximizing the amount of information encoded into long-term memory ( Craik, 1981). Serial clustering, the rote learning of items in order of presentation, is a less effective encoding strategy (Delis, Kramer, Kaplan, & Ober, 1983). The current investigation examined the relation in a traumatically brain injured population between measures of executive functions and the utilization of organizational strategies on a list learning task. Participants were active duty military or veterans enrolled in the Defense and Veterans Head Injury Program. Measures of executive function were derived using the Controlled Oral Word Association Test (COWAT), the Category Fluency Test (CFT), and the Wisconsin Card Sorting Test (WCST). Semantic and serial clustering memory strategies were measured using the California Verbal Learning Test. Correlational analyses revealed small, but statistically significant, direct relations between the use of semantic clustering and the COWAT, the CFT and WCST conceptual level response scores. Semantic clustering was inversely related to both total and perseverative errors on the WCST. Serial clustering was unrelated to executive functioning. This investigation demonstrates that the use of semantic clustering memory strategies is related to frontal lobe functioning in a traumatic brain injured population. Theoretical implications will be discussed.

### References:

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- Delis, D.C., Kramer, J.H., Kaplan, E., & Ober, B.A. (1983). *California Verbal Learning Test: Research Edition Manual*. San Antonio, TX: The Psychological Corporation, Harcourt Brace Jovanovich, Inc.

## IMPACT OF COMPREHENSIVE DAY TREATMENT ON SOCIETAL PARTICIPATION FOR PERSONS WITH ACQUIRED BRAIN INJURY

**James F. Malec**, PhD, Program Director, Brain Injury Rehabilitation, Mayo Medical Center, Rochester, MN, USA

### Objectives:

1. Describe methods and outcomes of Comprehensive Day Treatment (CDT) for persons with acquired brain injury.
2. Explain evidence from analyses by time since injury and extended baseline analysis for effectiveness of CDT.
3. Describe potential predictors and limitations of CDT.

**STUDY OBJECTIVES:** Evaluate Comprehensive Day Treatment (CDT) for persons with acquired brain injury (ABI) by time since injury; identify outcome predictors.

**PARTICIPANTS:** 96 program graduates; 17 dropouts with ABI.

**MEASURES:** Outcome: Independent Living Status and Vocational Independence Scale at program end and 1-year follow-up; Rasch-analyzed Mayo-Portland Adaptability Inventory (MPAI) and Goal Attainment Scaling (GAS) at program end; Predictor: age, education, severity of initial injury, time since injury, preadmission MPAI.

**RESULTS:** Significant goal achievement on GAS and improvement on MPAI; increased societal participation at 1 year follow-up for both those treated in the immediate postacute period as well as many years after injury. At one year follow-up, 72% of graduates were living independently; 39% working independently, 10% in transitional placements, 18% in supported or volunteer work. Long-term outcomes were modestly linearly related to preadmission and nonlinearly to time since injury.

**CONCLUSIONS:** CDT improves societal participation even among persons with a long history of limited participation after ABI. This de facto extended baseline analysis indicates the effectiveness of CDT and paves the way for randomized control trials of active treatment components. Relationships of predictors to outcomes are not sufficiently strong for patient selection. More effective interventions for vocational re-integration are needed for those most severely disabled after ABI.

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- Malec J. *Comprehensive-integrated postacute outpatient brain injury rehabilitation. Neuro Rehab* 1992; 2:1-11.
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- Malec JF. *Goal attainment scaling in rehabilitation. Neuropsychological Rehabilitation* 1999; 9:253-275.



**THE MAYO-PORTLAND ADAPTABILITY INVENTORY (MPAI): A PSYCHOMETRICALLY-SOUND MEASURE OF LONG TERM OUTCOME AFTER ACQUIRED BRAIN INJURY**

**James F. Malec**, PhD, Program Director, Brain Injury Rehabilitation, Mayo Medical Center, Rochester, MN, USA

**Objectives:**

1. Describe the psychometric properties of the Mayo-Portland Adaptability Inventory (MPAI).
2. Review evidence of the validity of the MPAI.
3. Review the use of the MPAI for service needs assessment and evaluation of postacute rehabilitation services.

**STUDY OBJECTIVES:** Evaluate the Mayo-Portland Adaptability Inventory (MPAI) as a measure of long term impairment, activity, and participation after acquired brain injury (ABI).

**PARTICIPANTS:** Numbers (in parentheses) of persons with ABI: Reliability. Initial Rasch analysis (305); Rasch analysis of revised MPAI (126). Validity. Concurrent (50); Predictive, vocational rehabilitation (114); Predictive, day treatment (96)

**RESULTS:** Reliability. Rasch analysis showed excellent internal consistency for Total Score (Person Reliability = .92; Person Separation = 3.49; Item Reliability = .95; Item Separation = 4.54). Principal components analysis identified two subscales with satisfactory reliability: Physical/Cognitive Impairment Scale (Person Reliability = .88; Person Separation = 2.66; Item Reliability = .97; Item Separation = 5.56) and Social Participation Scale (Person Reliability = .86; Person Separation = 2.46; Item Reliability .95; Item Separation = 4.17). Validity. Moderate correlations with Disability Rating Scale, Rancho scale, neuropsychological measures, and between Significant Other and Staff forms. Logistic regression (also including age, education, severity of injury, traumatic vs. nontraumatic injury) found Staff MPAI ( $c^2 = 8.30$ ,  $p < .01$ ) and time since injury ( $c^2 = 9.70$ ,  $p < .01$ ) were best predictors (69% correct classification) of long term outcome of specialized vocational services. The MPAI alone predicted vocational status (correct classification = 67%;  $c^2 = 5.33$ ,  $p < .05$ ) and independent living status (correct classification = 70%;  $c^2 = 6.85$ ,  $p < .01$ ) one-year after comprehensive day treatment.

**CONCLUSIONS:** The 30-item MPAI offers a psychometrically-sound measure of impairment, activity, and societal participation after ABI for use in service needs assessment and postacute service evaluation.

**References:**

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## INITIAL USE OF A TRAUMATIC BRAIN INJURY DATABASE IN AN INTENSIVE REHABILITATION WARD

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2. **Daniela Perelli Ercolini**, MD, Parma University Physical Medicine and rehabilitation Specialization School, Parma, Italy
3. **Fabrizio Dazzi**, MD, Parma Hospital Rehabilitation Dept., Parma, Italy
4. **Marco Franceschini**, Parma Hospital Rehabilitation Dept., Parma, Italy

### Objectives:

1. Start database; verify its feasibility.
2. Evaluate main premorbid, traumatic and outcome characteristics; compare them with other case series.
3. Verify:
  - outcome 1 year post-injury
  - some "return to work"- acute indicators predictivity.

### Introduction

Since July 1999 Intensive Rehabilitation Ward of Parma Hospital Rehabilitation Dept. started an inpatient TBI rehabilitation program.

Contemporaneously, rehabilitation team decided to examine these patients with a database constructed upon "TBI model systems national database" (TBIMSNDB) and "Minimal rehabilitative evaluation protocol for patients with traumatic brain injury" proposals.

### Objectives

- Start database; verify its feasibility
- Evaluate main premorbid, traumatic and outcome characteristics; compare them with other case series
- Verify:
  - outcome 1 year post-injury
  - some "return to work"- acute indicators predictivity.
- Use database for discussion and work development

### Results

An Access 1998 database was used to prospectively collect patients characteristics (39 +14 items).

- Sharing responsibilities and fixing collection rules made archive easily feasible.
- Findings about some of the included items will be presented, regarding the first 27 patients accepted, divided in following categories:
  - demographic
  - background



- Injury severity: (cause, GCS, PTA, length of coma, ICU LOS)
- Rehabilitation (FIM, DRS, rehabilitation LOS and LOT, GOS)
- Follow up (living situation, DRS, FIM, CIQ, Work/school)

Our data showed good comparability with first findings from TBIMSNDB

- “return to work”-acute indicators observed showed a “trend” comparable with other published studies (our small sample couldn’t permit reliable statistical analysis)
- Data discussed in team meetings helped in new projects development.

### Conclusions:

Database permitted:

- reflection on daily work on a more objective basis and comparisons with other centers
- team discussion and new projects.

Sample increase will bring more reliable and interesting results.

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## EMPOWERMENT FACTORS OF BRAIN DAMAGED SURVIVORS IN REHABILITATION

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Objectives:

1. To develop Empowerment Questionnaire for brain damaged persons based on a postulated empowerment model as an effective and valid measures of their coping effort.
2. Descriptive analysis of open-ended questions about expectations, coping strategies and current needs.

**Objectives:** This study was an extension of the previous studies on the empowering of families with a brain-damaged member. The demand of adopting such similar empowerment concept in direct rehabilitation of brain damaged patients was proposed. It aimed at the development of a theory-driven instrument, in the form of a patient-administered empowerment questionnaire, so as to establish brain-damaged patients' empowerment factors during their rehabilitation process.

**Method:** This questionnaire derived items from both existing literature on brain damage rehabilitation and related studies on persons coping with their brain damage. Open-ended questions were also included to investigate how the patients may be encouraged to achieve successful rehabilitation (such as degree of acceptance, learning of adaptive skills and community re-entry).

**Results:** A structural empowerment model has been constructed by both content validity analysis and construct validity through explorative factor analysis of 112 brain damaged persons. A 42-item questionnaire has thus been developed, constructing 4 interpretable factors: Support (13 items), Skill (14 items), Aspiration (9 items), Knowledge (6 items) which accounted for 49.99% of the total variance. Analyses of open-ended questions showed that brain damaged persons generally lack external resources and support in the coping process. They did not have sufficient information to face their problems in a variety of areas though they were quite aware of their importance. They could only rely on personal assets and families only, and less on friends, work-mates, and external social resources. It is suggested that the results of this initial empowerment framework can guide the ways to either improve case management of brain damaged patients (in terms of structure, methods, and evaluation mechanism) or may assist in research and design (R & D) of rehabilitation programs with better efficacy and effectiveness. Further research using Rasch Analysis to establish item difficulties and using it as outcome measure in rehabilitation had been recommended.

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## EPIDEMIOLOGY OF TRAUMATIC BRAIN INJURY IN TUSCANY

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### Objectives:

1. TBI incidence rate, risk factors, and causes.
2. TBI clinical course.

Among all types of injuries, those concerning brain are the most invalidant because frequently results in death and often produce an important social impact both for the young age of patients and for the permanent disabilities.

In USA some studies show that every 100.000 persons about 230 have TBI with permanent disabilities and about 20% of these die.

In Italy the few available studies show that TBIs are about 200-250 every 100.000 persons and the leading cause concerning motor vehicle crashes.

Using data collected by the Individual Schedule (SDO), our study points out the TBI in Tuscany during the 1997.

Among 724.408 patients admitted to the Hospitals in Tuscany in 1997, we studied 13.604 patients who received the diagnosis of TBI according to the ICD-9 coding system using the Hospital Individual Schedule (SDO).

In our study we considered age, sex, country, job, the type and the average of hospitalization, and the causes on TBI.

Most of the patients are males, the females are older than males.

The risk of TBI is particular high in adolescents, young adults, and people older than 76 years of age.

In about 2% of patients we observed coma and the leading causes of TBI are motor vehicle crashes. Other causes of TBI are job, domestic and sport's accidents

We present and discuss the statistic analysis. Very interesting is the clinical course that frequently do not implies the correct use of specific specialistic structures

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## CONSUMER DRIVEN OUTCOME MEASURES FOR THE EVALUATION OF AN ACQUIRED BRAIN INJURY COMMUNITY INTEGRATION PROGRAM

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2. **Kelly Milne**, BScOT, The Rehabilitation Centre, Ottawa, Ontario, Canada
3. **Fred Pelletier**, PhD, Psych, The Robin Easey Centre, Ottawa, Ontario, Canada
4. **Lloyd Cowin**, BSc MHA, The Rehabilitation Centre, Ottawa, Ontario, Canada

### Objectives:

1. To identify essential elements for an Acquired Brain Injury community reintegration program.
2. To use consumer focus groups to identify assessment criteria.

Although Continuing Quality Improvement initiatives and program evaluation should include consumer survey and opinion, questions and outcome measures are typically generated and developed solely from a professional or provider perspective. Therefore the primary objective of this project was to develop consumer derived assessment criteria for an Acquired Brain Injury community reintegration program for persons with moderate to severe brain injury. From these consumer identified criteria the investigators intend to develop an assessment tool that will be validated for program evaluation of ABI community reintegration programs.

For this project, seven focus groups were conducted: four with clients, two with care givers and one with health care professionals. Focus groups identified gaps in the community reintegration system and focussed on elements that would contribute to a supportive environment for eventual community reintegration. Voting on prioritization of contents of a satisfaction survey was carried out in these sessions. Qualitative analysis of the focus group results was carried out to examine for common essential elements that would need to be included in a satisfaction survey for evaluation of an ABI community reintegration program.

As a result of the focus groups, six essential themes for an effective community reintegration program were identified: 1) Life skills 2) Personal organizational strategies 3) Support and information/ education on brain injury 4) behavioral management/ social skills 5) Fit in the continuum of care including appropriated referrals and on-going case management during and after transitional care 6) Occupational and vocational counseling.



**THE IMPACT OF INTRATHECAL BACLOFEN ON GASTROINTESTINAL FUNCTION  
IN PATIENTS WITH BRAIN INJURY**

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3. *Leopold Saltuari*, MD

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Intrathecal baclofen (ITB) application has become the first choice in the management of otherwise intractable spasticity. The mechanism whereby ITB alleviates increased skeletal muscle tone is generally accepted, however, less is known about its effect on smooth muscles. We present two patients who developed a paralytic ileus during ITB infusion for supraspinal spasticity due to traumatic brain injury. We also performed a retrospective chart analysis of nine patients receiving ITB with respect to their intestinal function. We calculated the cumulative sum of days without bowel movements plus the cumulative sum of interventions intended to promote intestinal peristalsis, e.g. application of laxantic or prokinetic drugs before and during ITB treatment. Intestinal function deteriorated in eight, remained unchanged in one, and improved in two patients compared to baseline. This is the first study in traumatic brain injury patients addressing a previously unnoticed, but potentially deleterious side effect of ITB treatment. Our findings suggest, however, that close observation of intestinal activity in conjunction with the generous use of laxantic and prokinetic drugs may allow for continuation of ITB treatment even in particularly sensitive patients.



## **ETHICS COMMITTEE INVOLVEMENT IN IMPROVING BRAIN INJURY REHABILITATION OUTCOMES**

1. *Andrew D. McCarthy*, MD

2. *Jennifer E. Martin*, MA CCC SLP

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### Objectives:

1. Clinical application of three models of ethics committee clinical involvement in brain injury cases.
2. Identification of principles involved in ethical decision-making in brain injury rehabilitation.

The rehabilitation professionals and team strive to deliver meaningful care and outcome to each patient served. Yet, in today's environment, the assessment of these measures is somewhat subjective and can be a source of controversy between the team, the family and the payor of the care. The disagreements are sometimes difficult to resolve in a positive fashion. The National Rehabilitation Hospital has started a program that intricately involves the hospital's Ethics Committee in helping the brain injury program resolve such difficult cases. The ethics committee helps the team define the ideals which set forth the moral principles and guidelines needed to distinguish right from wrong / good from evil. It also helps the team evaluate the circumstances which define the specific facts in each case. The ethics committee helps the team arrive at a decision via a discussion of such ideals and circumstances.

The committee, which has both hospital and non-hospital members, has been used effectively via three models. The models are the following: 1) The ethics committee will directly review a case during the monthly meeting; 2) The ethics committee's consultation team will review a case within 24 hours of a formal request; 3) An individual member of the committee can be consulted for a less formal review. These models will be discussed in case study formats. Principles of ethical decision-making and how they facilitate positive outcomes for each case will be discussed in detail.



## DEVELOPMENT AND USE OF A MULTIMEDIAL TOOL TO SUPPORT VOCATIONAL REHABILITATION OF TRAUMATIC BRAIN-INJURED PATIENTS

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2. **Gianpiero Vaschetto**, Director Multimedial Department, Poliedra S.P.A., Torino, Italy
3. **Federica Priano**, PD Consultant Psychologist, Genova, Italy
4. **Massimo Mantero**, MD Head of Rehabilitation Department, Azienda Ospedaliera San Martino, Genova, Italy

Objectives:

1. To develop a simple, flexible and specific multimedial tool in order to support vocational rehabilitation of traumatic brain-injured patients with mild adaptive and behavioural trouble.

### INTRODUCTION AND OBJECTIVES

For brain injured patients the transition from medical rehabilitation to program of supported employment is always a critical phase.

We have developed a simple but flexible and specific software that could result an useful help in vocational rehabilitation of these patients having mild adaptive and behavioural troubles.

### MATERIALS AND METHODS

For the realisation of this tool we have selected a series of:

1. job “situations” that can be interpreted in different roles, requiring a good degree of behavioural and relational skills. Each of these “situations” was coupled with multichoice four answers.
2. job “actions” requiring a good degree of adaptive skills (initiation, sequencing, shifting and problem solving).

The software was conceived to be used in different ways (individual, group, independent and assisted) and by patients with different levels of disability.

The experimentation began in 12 brain injured patients involved in a vocational program in office-automation realised in collaboration with Kantea s.p.a. and financed by Labour Ministry.

### RESULTS AND CONCLUSIONS

The software proved itself to be useful and adaptable to the users needs.

Particularly interesting has been the group work in which the therapist manages, from the computer central desk, the vocational session suggesting the “situations” and guiding group discussion.

As this first phase of experimentation showed some problems, next targets for future



improvements are the following:

1. A better scaling of the difficulties
2. An implementation of the software with the development of new “actions”
3. An improvement of graphic quality and presentation

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## CHARACTERISTICS OF IMPAIRED AWARENESS USING THE PATIENT COMPETENCY RATING SCALE (PCRS)

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3. *M. García Peña*, Occupational Therapist, Hospital Beata María Ana, Madrid, Spain
4. *N. Álvarez Rodríguez*, Neuropsychologist, Head Injury Service, Hospital Aita Menni, Bilbao, Spain
5. *M. Ríos Lago*, Neuropsychologist, Head Injury Service, Hospital Beata María Ana, Madrid, Spain

### Objectives:

1. Study the concordances and differences between patients' and family members' rating of competency after traumatic brain injury.

**Introduction:** Impaired awareness of the effects of brain injury is a commonly observed and poorly understood finding in Traumatic Brain Injury (TBI) survivors. Nonetheless, impaired awareness has been identified as a major factor in determining outcome for TBI survivors. The Patient Competency Rating Scale (PCRS) provides both patient- and informant-ratings of everyday activities and memory and gives a guide to patients' awareness of difficulties.

**Objective:** To study the concordances and differences between patients' and family members' rating of competency after traumatic brain injury.

**Method:** The Spanish version of the PCRS ("Índice de Competencia del Paciente, ICP") was administered separately to 60 adult patients with traumatic brain injury and their families as part of the evaluation and rehabilitation program. Data from patients and families were obtained in all cases. All patients were receiving outpatient rehabilitation at the time. TBI was classified as severe or moderate according to initial Glasgow Coma Scale score.

Differences were analysed using t tests of the four factors proposed (Activities of daily living, interpersonal, cognitive and emotional).

**Results:** The results of the study show statistically significant differences between patients and family members rates. The patients tend to underestimate their deficits but the discrepancy is not the same for the four factors. These findings have important implications for clinicians who must take into account that deficit awareness is not an unitary problem and its treatment should be specifically directed to the most impaired areas.



## INCIDENCE OF AXONAL INJURY IN HUMAN BRAIN TISSUE - AN IMMUNOHISTOLOGICAL STUDY ON 450 CASES

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3. *Hansjürgen Bratzke*

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### Objectives:

1. Diffuse axonal injury.
2. Traumatic brain injury.
3. Drug intoxication.

Diffuse axonal injury (DAI) is characterised by the presence of widespread axonal damage in the white matter of the cerebral hemispheres, corpus callosum and brainstem [1] and is considered to be the morphological correlation of traumatic brain injury. It is seen in acceleration / deceleration traumata and most common in victims of traffic accidents. DAI is considered to be the main cause for a poor clinical outcome in absence of intracranial lesions. The majority of cases need microscopical examination for assessing the diagnosis, it is unknown whether ageing processes lead to DAI, literature data provide that ischemic / hypoxic conditions lead to the observed morphological changes as well [2,3]. To estimate the overall incidence of axonal injury (AI), tissue of non selected, consecutive autopsies (n=450) was investigated. Two brain areas (pons and cerebrum) were immunostained for  $\beta$  amyloid precursor protein [4], axonal damage was assessed microscopically. 12% of all cases showed axonal injury, only one third of these positive cases was associated with traumatic brain injury. The majority of cases exhibiting AI was associated with drug intoxication, mainly opiates. Comparison of AI intensity in the different brain areas revealed, that cases of intoxication showed significantly higher simultaneous staining of both parts, pons and cerebrum, than the trauma cases, where AI was observed mainly in the pons. The low incidence of 12% does not support the assumption of a high number of undetected cases, ageing processes do not contribute to DAI but drug users are at risk for developing diffuse axonal damage.

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## DISORGANIZED APPROACH IN PERCEPTION AND LONG-TERM VOCATIONAL OUTCOME OF TBI PATIENTS

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3. *Seppo Sarna*, Associate Professor, Department of Public Health, University of Helsinki, Finland
4. *Markku Kaste*, Professor, Department of Clinical Neurosciences, Helsinki University Central Hospital, Finland

### Objectives:

1. To look for neuropsychological test indicators of outcome after TBI.
2. To study the effect of age at injury, length of coma and post-traumatic amnesia on late perceptual organization.

A "complex figure" was first devised by Rey 1941 to investigate both perceptual organization and visual memory in brain damaged subjects and standardized by Osterrieth 1944. In previous studies it has been shown that frontal patients easily lose track of what has been drawn because of a disorganized approach. They also have disturbances in their ability to program the approach to copying the figure. (1) Return to work after traumatic brain injury (TBI) has been studied rigorously as a common outcome measure of TBI, searching for possible indicators and neuropsychological tests predicting late outcome of TBI. (2) After TBI at preschool age, tests measuring executive functions have been shown to be associated with vocational outcome. (3) The Rey Complex Figure Test (RCFT), delayed recall has been shown to have relationship to outcome. (4) In this study, in addition to memory, the copying part of the RCFT was used as an indicator of perceptual organization skills ("executive capacity") of TBI patients.

The effect of age at injury on test performance was studied in three age groups (< 7 years, 8-16 and > 16 years), as well as the effect of injury severity measured by Glasgow Coma Scale (< 8 severe, 9-12 moderate and > 12 severe injury). The post-injury occupational outcome was divided into three groups: independent employment (N=45), subsidized employment (N=18) and inability to work (N=32). The capacity for work could be evaluated in 95 patients. 45 patients were excluded from this outcome variable because they were still at school or continuing their education without work experience.

The comprehensive neuropsychological test battery included the Rey Complex Figure Test, which was scored according to the Rey-Osterrieth system. One-way ANOVA has been used in statistical analysis.



### Conclusions:

1. Age at injury seems to have an effect on late perceptual organization and programming of performance. Patients older than 16 years at time of injury performed significantly better  $t(p = .017)$  than younger patients in the copying part of the test.
2. Injury severity did not have an effect on test performance when Glasgow Coma Scale scores were used as a severity indicator. Interestingly, length of coma (LOC) and post-traumatic amnesia, which also are used as measures of severity, showed significant associations with test performance at cut-off points of one week and four weeks, respectively.
3. There was a significant association between test performance in the Rey Complex Figure test and late capacity for work, the independent working group scoring significantly higher in both copying and memory part of the test, the independent working group being homogenous in their test performance (with small standard deviation compared to the other two groups).
4. It is suggested that the Rey Complex Figure Test might be a useful indicator of late outcome after TBI. Further qualitative analysis of the strategies and mistakes is needed to clarify its role as a test of executive functions.

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**THE IMPORTANCE OF NATURE IN COPING WITH A CRISIS. PERCEPTIONS OF NATURE DURING THE REHABILITATION AFTER A BRAIN INJURY. AN INTROSPECTIVE STUDY**

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Presentation of a publication that raises the outdoor environment as an important part of the total environment of hospital care.

In this publication Johan Ottosson describes his own experiences of the natural surroundings around Orup Hospital. He was a patient at the ward for rehabilitation of traumatic brain injury after a car accident in 1991. The natural landscape around Orup became an important part of his "way back". Through contacts with others, who also have gone through serious life crises, Johan has found that many people have had similar experiences. This fact has given him the courage and inspiration to "open himself" and describe the feelings he first thought were strange.

This publication raises the outdoor environment as an important part of the total environment of hospital care. In the beginning of the 1980s new research findings showed that if the patients had a view of parks and green spaces, they recovered more rapidly. Furthermore they used less analgesics. Many studies have since shown similar results and now we know that nature experiences have positive effects on people's health.

Johan Ottosson is a researcher in the field of the significance of parks and green areas for people's health and well-being. In the present work he has used the so-called introspective method, where the intention is, in a more objective way, to try to describe and understand why you react the way you do. This report is a contribution and a piece of a puzzle that has long been missing in the research that tries to clarify how we are influenced by the outdoor environment in general and by nature in particular.

The publication forms parts of Johan Ottosson's doctoral thesis.

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## PROPHYLAXIS OF POST-TRAUMATIC EPILEPSY: IS IT A BENEFIT OR A RISK? A CLINICAL STUDY

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3. *F. Monaco*
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In spite of Brain Trauma Foundation and European Brain Injury Consortium guidelines (1995), that do not recommend pharmacological prophylaxis for late post-traumatic seizures (LPTS), the use of antiepileptic drugs (AEDs) is still common after severe TBI.

To evaluate efficacy and risk of AEDs withdrawal after severe head trauma, we reviewed clinical charts of 108 adult patients with severe TBI hospitalized from 01/01/1998 to 31/12/1999. For each patient we registered the presence of the following characteristics, usually accepted as risk factors for LPTS: age, duration of coma, 24h GCS, cortical contusion, depressed skull fracture, subdural or epidural or intracerebral hematoma, early seizures. All patients underwent a slow withdrawal of AEDs. We excluded 2 patients with pre-traumatic epilepsy who continued to have tractable seizures after TBI. We considered only 65 patients who had more than 12 months follow-up.

The overall occurrence of LPTS was 24% and correlated significantly with subdural or intracerebral hematoma and with coma duration. The occurrence of LPTS in TBI patients previously receiving (n=15) or not receiving (n=50) prophylaxis was 27% and 24%, respectively. The occurrence of epilepsy was 13% vs. 10%, respectively. Depressed skull fractures and neurosurgical treatments were more likely in the prophylaxis group but they did not correlate with LPTS occurrence. Time interval from TBI to first seizure was not significantly different in the two groups.

This study confirms that AED prophylaxis does not reduce the risk of LPTS and epilepsy.

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## INCIDENCE OF SEIZURES AFTER WITHDRAWAL FROM PROPHYLACTIC ANTIPILEPTIC DRUGS IN PATIENTS WITH ANEURYSMAL BLEED

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### Objectives:

1. To determine the long term incidence of seizures after subarachnoid hemorrhage secondary to aneurysm rupture.
2. To analyze the occurrence of seizures among patients kept on anticonvulsants and those who were not.
3. Try to determine risk factors that could predispose to the development of seizures in this population.

**BACKGROUND:** Seizure prophylaxis after subarachnoid hemorrhage (SAH) secondary to aneurysm rupture is a common neurosurgical practice although the available literature does not clearly substantiate its use. When considering the cognitive and systemic effects of the various antiepileptic drugs (AED), it seems that their use in this population outweigh the benefits. Following the same rationale as for patients with traumatic brain injury, psychiatrists may tend to withdraw AED in those patients without documented seizures without necessarily increasing their likelihood. **DESIGN:** We reviewed the charts from all patients with the diagnosis of SAH admitted to our brain injury program, from 1993 to 1998. We then analyzed the occurrence of seizures during and after discharge from the rehabilitation program. The patients were divided into three groups: those treated for seizures, those weaned off anticonvulsant while on rehabilitation, and those that never received AED. **RESULTS:** The overall incidence of seizures was 11%. The incidence in the treatment group was 21.4% versus 10.5% on those patients that were weaned off AED and 4.76% on those that were never treated. All the patients in the treatment group seemed to have had complicated surgeries compared to the other two groups. The degree of difficulty of the surgery could be identified as a risk factor for the development of seizures and other risks factors identified previously in the literature did not seem to be identified with increased frequency in these patients. **CONCLUSION:** Although limited by the study design and sample size, these results suggest that the use of prophylactic AED may not be warranted after aneurysmal bleeding.

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## **THE EFFECT OF METHYLPHENIDATE ON SELECTIVE ATTENTION IN TBI PATIENTS.**

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### Objectives:

1. The study was designed to investigate the possible effect of methylphenidate on shifting selective attention.

Brain injury causes a variety of neuropsychological deficits. Disturbances of arousal and attention are among the most common ones. Attention is general concepts that include different aspects that influence the ability to perform a task correctly. Psychostimulant medication such as Methylphenidate (Ritalin) is generally used in traumatic brain injury (TBI) in an attempt to improve attention and arousal. The influence of such treatment on the efficiency to shift selective attention was studied. Four TBI patients were tested by a special paradigm. They were asked to identify stimuli (1 out of 5) on a screen of a computer. The stimulus was presented for 33 ms after a cue signal, which appeared for 150 ms at 5° of visual angle either in left hemifield (LHF) or in right hemifield (RHF). The test was performed before, during and after withdrawal of Ritalin treatment.

In previous study it was demonstrated that TBI patients exhibited a difference in performance between the two hemifields with significant failure in leftward shift of attention from the RHF to the LHF. Marked reduction of this asymmetric ability was achieved by Ritalin treatment.



## THE VANISHING CUES METHOD AS A TOOL FOR THE REHABILITATION OF VERBAL LEARNING DEFICITS IN A BRAIN INJURED ADOLESCENT

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### Objectives:

1. The present research explored whether the method of Vanishing cues would be a valid tool for learning a new vocabulary in a young patient with post- traumatic anomia.
2. Attention was paid to select a pool of stimuli, which, rather than being "laboratory-like", could be useful for improving the young patient's academic skills.

Impairment of language access is a frequent consequence of brain injury, with particularly devastating consequences in development as children and adolescents must constantly learn new information and skills. The present research explored whether the method of vanishing cues would be a valid tool for learning a new vocabulary in a young patient with post- traumatic anomia. Attention was paid to select a pool of stimuli, which, rather than being "laboratory-like", could be useful for improving the young patient's academic skills.

### Method

Subject. FC is a 17 years old adolescent who underwent a severe traumatic brain injury at 15 years of age. The treatment was started two years after the injury when language and verbal memory were still impaired with persisting anomias and difficulties in learning verbal information.

Stimuli and procedure. 32 words were selected, from a set of new words which FC was expected to learn during the following academic year for the exam of Economics, and divided in two lists. The Vanishing Cue (cues of increasing length given to the subject until correct production of the word corresponding to a semantic definition) and the Anticipation methods (no cue given) were applied.

### Results

Within each session and all over the treatment period the Vanishing method appeared more efficient than the control method. After a 6-week period FC was able to recall all the 16 words with both methods. These results support the utility of memory treatments specifically addressed to meet the demands of single patients' everyday life.



## 100 HZ NEUROMUSCULAR VIBRATORY STIMULATION FOR THE TREATMENT OF WALKING DISORDERS AFTER BRAIN INJURY

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This research evaluates the effects of a 100 Hz neuromuscular vibratory stimulation on the walking performances of subjects with stabilized clinical conditions after severe traumatic or vascular brain injury.

15 subjects were evaluated 18 months after the event on the basis of 4 clinical assessment scales: the Standing Balance by Bohannon, the Index According To Hauser, the Time Walking Test and the Gait Assessment Rating Scale (GARS).

Test subjects were subdivided into two randomized groups, each receiving either a 100 Hz or a 10 Hz (control group) stimulation in a double-blind condition.

The vibratory stimulation was always given bilaterally and directly on the skin corresponding to the muscular group to be treated. For the whole duration of treatment subjects were requested to keep a minimum contraction of the stimulated muscles (alpha-conditioning).

The results obtained in both groups were submitted to statistical processing using the Mann-Whitney test, which pointed out no baseline differences. In the subsequent comparative analysis of pretreatment and post-treatment data using the Wilcoxon test, a statistical significance was observed only in the group of subjects treated with 100 Hz stimulation.

In the Time Walking Test patients treated with 100 Hz stimulation showed a statistically significant improvement (.016/.018) in the short-distance speed (at 5, 10 and 20 meters) and in the endurance test for 2, 6 and 12 minutes' walking time.

In the Gait Assessment Rating Scale the only improved parameter was the angle at which the heel reaches the ground before the forefoot, with a statistical significance of .034.

The results obtained in this research seem to confirm the therapeutic efficacy of a 100 Hz neuromuscular stimulation in improving the level of motor performances in stabilized subjects after severe brain injury.

The benefit is probably due to an enhanced efficiency of neural control circuits with a consequent saving of muscular energy. Since an improvement of the motor pattern during walk could not be proved by the test, it is necessary to conclude that the 100 Hz vibratory stimulation should always go together with an adequate rehabilitation treatment in order to ensure optimized results.



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## NEUROPSYCHIATRIC SEQUELAE IN TRAUMATIC BRAIN INJURY: A 5-YEAR EXPERIENCE

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**Objective:** Traumatic brain injury (TBI) is the leading cause of death and permanent disability in developmental age. Neurobehavioral symptoms are not uncommon in these patients. The aim of this study is to identify the main neuropsychiatric sequelae of TBI at different ages and study the possible correlation with clinical features in the acute phase and outcome in order to better plan rehabilitative treatment and re-entry into society.

**Subjects and methods:** The study cohort included 96 post-traumatic patients, ranging from 2 to 35 years who in the past 5 years were admitted to our Institute for assessment and rehabilitation. We divided the patients into 3 age groups according to age at trauma: before 10 years, aged 11-18 years, aged 19-35 years. The study used a prospective follow-up design over one year. Severity of injury and outcome were assessed by standard clinical scales as Glasgow Coma Scale (GCS) and Glasgow Outcome Scale (GOS). The patients received a complete clinical and functional assessment. They were also administered a psychological evaluation protocol through age-appropriate scales and behavioral observations. All data collected were statistically analyzed.

**Results:** The subjects showed the following demographic characteristics: mean age at injury was 15.2 years; 69 patients were males. TBI severity in the acute phase was as follows: 87 (90,7%) severe and 9 (9,3%) moderate. At one-year follow-up, 12 patients had a severe disability, 54 a moderate disability and 30 had no disability according to the GOS. Psychiatric disorders were present in 14 of 29 patients before 10 years of age, in 22 of 38 patients aged 11-18 years and in 25 of 29 patients aged 19-35 years. Patients belonging to the first group showed a higher frequency of behavioral difficulties such as hyperactivity, safety hazard, sleep and eating problems and dependence problems; the second age group showed more frequently socialization problems, depressed mood, verbal outburst, irritability and slowness in thinking. Patients belonging to the third group exhibited more frequently inappropriate or disinhibited behavior, depressed mood, lack of initiative, inability to plan or make a decision, tiredness and lack of insight.

**Conclusion:** Neuropsychiatric sequelae are frequent disorders after TBI at all ages and they can interfere with outcome.

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## BOTULIN INJECTION IN UPPER LIMB MOTOR DISORDERS AFTER TBI: A QUANTITATIVE EVALUATION OF OUTCOME

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3. *Angelo Maria Sabatini*, Eng. Scuola S. Anna, Pisa, Italy
4. *Michele Coluccini*, PT Stella Maris Scientific Institute, Pisa, Italy

Objectives:

1. Identify several new technologies being used for identification and treatment of brain injury.
2. Describe current models of rehabilitation programs serving those with brain injury.

Authors have worked out a methodology based on kinematic movement analysis that is useful for showing how and how much upper limb motor function improve after botulin injection in a TBI patient.

Subject is an 18th years old patient that stays in coma state, after TBI, (GCS 6) for 1 month and in minimal responsiveness state for 3 months. One year late he showed a left spastic hemiparesis with flexed elbow, wrist and finger (Ashworth scale 3).

250 Unit of toxin have been injected in flexor carpi radialis, flexor digitorum profundus and palmaris longus. Muscles have been localized by electrical stimulation (2 Hz,-0.1 ms) with electrode needle. Toxin has been injected using the same needle.

The kinematical data were recorded using an optoelectronic motion analyser. Three infrared-reflective markers were attached to the shoulder acromion, lateral epicondyle and midpoint between radial and ulnar styloids. The elbow was positioned on a table with the forearm in the neutral position. The subject was asked to perform ten elbow flexion-extension movements its entire range of motion (ROM). Two trials were executed at comfortable speed (CS), freely selected by the subject, and at maximum speed (MS). Phase plane and jerk analysis have been conducted as in [1] [2] and several parameters (NAJ - Normalized Averaged Jerk, CPA - Coefficient of Periodicity of Acceleration, NLI - Non-Linearity Index) have been calculated before and after botulin injection. Results are summarised in table

Pre-BTA	Movement Duration [s]	ROM [deg]	NAJ-Flexion	NAJ-Extension	CPA	NLI
CS Test1	1.674	84.38 ± 3.99	42.94 ± 10.03	153.33 ± 104.00	0.612	0.301
CS Test 2	1.686	88.05 ± 4.76	81.44 ± 78.64	147.56 ± 77.73	0.472	0.288
MS Test 1	1.476	81.06 ± 5.20	45.15 ± 16.47	116.15 ± 67.06	0.547	0.234
MS Test 2	1.437	81.38 ± 8.00	39.18 ± 19.11	184.80 ± 167.11	0.634	0.355
CS Test 1	0.664	99.03 ± 1.77	16.32 ± 5.80	34.31 ± 12.17	0.736	0.138
MS Test 1	0.429	97.39 ± 2.27	15.93 ± 18.45	11.74 ± 4.83	0.937	0.084
MS Test 2	0.362	100.07 ± 5.19	13.87 ± 6.03	8.78 ± 0.85	0.949	0.087

Quantitative assessment of quality of movements based on these parameters shows an extended ROM and an increased periodicity of the movement; at the mean time strong reductions of both NAJ and NLI are observed proving the quantitative evaluation of the effectiveness of BTA injection.

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## PSYCHOSIS AFTER TRAUMATIC BRAIN INJURY

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3. **J.M. Muñoz Céspedes**, Clinical Director, Head Injury Service, Hospital Beata María Ana, Madrid, Spain

### Objectives:

1. Assess prevalence of psychosis in a large sample of patients with Traumatic Brain Injury.
2. Describe clinical features and family history of psychiatric illness and compare with classical schizophrenic patients.
3. Assess the relationship between localization of damage and presence of psychosis.

### Introduction

Psychosis is an uncommon complication of Traumatic Brain Injury (TBI). When it occurs, conflicting aetiological hypotheses are put forward. Each of them have different medico-legal implications. Some psychiatrists think that these psychotic episodes are nothing different but a schizophrenic illness. Other authors have argued, on the basis of epidemiological and clinical data, that Posttraumatic Psychosis is an uncommon but clearly differentiated syndrome. This study tries to shed light upon this issue.

### Methodology

A sample of 300 patients with Traumatic Brain Injury were included in the study. They were all referred to a multidisciplinary Brain Injury Rehabilitation Service (Hospital Aita Menni, Basque Country) either for assessment or treatment. As part of the initial assessment a psychiatrist saw the patient and diagnosed psychiatric illness if present according to ICD 10 criteria. Psychotic syndromes that lasted at least several days and that presented in clear consciousness (outside the confusional state) were selected. These patients required specific psychiatric treatment for this illness. Patients that experienced hallucinations or delusional ideas that were brief in duration and did not require specific psychiatric treatment were not included. Patients with pre-trauma history of psychotic illness (only 1) were excluded.

A control sample of Brain Injury patients without psychotic illness matched for age, sex and severity of illness was used.

The following variables were studied:

- Lapse of time since Brain Injury to onset of psychotic illness
- Comorbidity of affective illness
- Localization of injury
- Family history of psychiatric illness



## Results

- Prevalence of psychosis following TBI in this sample is 3,7%
- Comorbidity of Psychosis with affective disorder is high if compared with schizophrenic illness
- In all but one case psychotic illness started within the first year after Brain Injury
- Only one case had family history of schizophrenic illness
- Results on localization of damage fail to show a clear pattern

## Summary

This study strongly suggests that Psychosis after TBI is a separate entity from schizophrenic illness

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## THE NEUROLOGICAL TEST AND OUTCOME OF PATIENTS IN A POST TRAUMATIC VEGETATIVE STATE

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The course of the neurological signs that are significant for the outcome was evaluated in a period of time (every 15 days) in 65 patients (average age 27) that were in a Vegetative State for more than 1 month.

Of the 23 neurological signs that were examined, the ones that indicate the recovery phase with most prognostic importance were:

1. Spontaneous Mobility; 2. Oral Automatism; 3. Orientation Reaction.

21 patients (age 27) who were discharged in IV and V G.O.S. class (18.46% and 13.84%), after 120 days of hospitalization (intensive care and rehabilitation), with an average initial Glasgow rate of 7.9 showed spontaneous mobility, orientation reaction and remission of oral automatism within 75 days after brain damage.

20 patients (age 29) who were discharged or transferred in III G.O.S. class (30.76%) after 200 days of hospitalization with an initial Glasgow rate of 7.2, showed orientation reaction and no oral automatism within 150 days. 5 patients did not have spontaneous mobility.

15 patients (age 27) who were discharged or transferred in II G.O.S. class (23.07%), after 379 days with an initial Glasgow rate of 6, had no spontaneous mobility and the persistence of oral automatism after 200 days.

9 patients died due to complications in I G.O.S. class (13.84%). These had an average age of 32 and had been in hospital for 306 days with an initial Glasgow rate of 6.

### Conclusion

Only the evolution in time of the neurological test, more than the image tests (TC, RMN) and neurophysiologic tests, allows the evaluation of the level of brain functions, their deterioration to a lower level and the recovery towards higher physio-anatomic structures and therefore gives the prognosis on the kind of outcome one may have.



## **“ZARJA” PROJECTS FOR QUALITY LIFE AFTER BRAIN INJURY IN SLOVENIA**

1. **Irena Rebersak**, Prof. Soc. Ped. Institute for Care and Rehabilitation Therapies after Brain Injury, Zavod Zarja, Ljubljana, Slovenia
2. **Professional Team of Zarja Institute**

### Objectives:

1. Enabling convalescents to lead quality lives and their incorporation into society.
2. House offering opportunities for independent life.
3. Professional help and relieving the families of their burden.

The ZARJA Institute is organized for individuals who have suffered brain injury and thus are not able to return to their educational or work programmes after rehabilitation therapy.

The main purpose is the incorporation of the injured into society and environment as well as relief for their families. The poster comprises three basic programmes or units.

1. Daily ward providing rehabilitation, psycho-social and pedagogical programmes for teaching quality life with changed abilities, searching for new goals and new roles in society.
2. Daily ward for the individuals, being supported at length by different psycho-social and pedagogical programmes, who have the ability to work, who want to work as well as regain their self-confidence in their work and are rewarded for their accomplished tasks. Less exacting work is being performed along with different creative techniques. The incorporation of these individuals into society is greatly stressed.
3. The house which provides shelter and professional assistance for eight young people who have suffered serious brain injuries but have decided to live an independent life or have no relatives who might take care for them. They have been well accepted by their neighbours and have thus become equal members of the community.
4. All three units share the same programmes for families: professional meetings, individual counselling, the New Years' parties, picnics, camping

### References:

- *active participation in different professional congresses in Slovenia*
- *active participation in congresses abroad (Alpe Jadran - Tobelbad, Luzern)*
- *17 years work with individuals who have suffered brain injuries*
- *foundation of ZARJA, a private institute for quality life after brain injury*



## **AN INVESTIGATION OF THE PROBLEMS FACED BY SPOUSAL CARERS OF BRAIN-INJURED INDIVIDUALS**

*Magdalen Rogers*, Information Support Service Co-ordinator, Headway Ireland, Dublin, Ireland

### **Objectives:**

1. Head injury can negatively impact on the non-injured spouse and especially on the nature of the marital relationship. The specific relationship changes arising as a result of brain injury have not been investigated in any great detail to date. This study aimed to describe the experiences of spousal caregivers.

**Method:** Three focus groups were conducted with 11 wives of head-injured men. Transcripts were analysed by a process of open and axial coding and theme identification.

**Results:** Five main areas of themes were identified: changes in the head-injured person and the spouses feelings towards them, changes in the marital relationship, effects of the injury on the spouse and children, support and coping and services and information. Specific experiences described within these themes included negative feelings towards the head-injured partner, changes in marital and parenting roles and expectations and feelings of loneliness, isolation and anxiety. Finally the participants identified a lack of information available to prepare them for these changes and lack of consideration of these issues among service providers.

**Conclusion:** This study identifies the problems experienced by a specific group of carers, i.e. spouses and the effect of the changes associated with the brain injury on the spouse, children and family unit. This research provides a strong basis for future investigations into this hitherto neglected area.



## **PSYCHOSOCIAL CHANGES AFTER TRAUMATIC BRAIN INJURY (TBI). PERCEPTION OF PATIENT AND FAMILY ASSESSED BY KATZ ADJUSTMENT SCALE**

1. **Teresa Roig**, Neuropsychologist
  2. **Antonia Enseñat**, Neuropsychologist
  3. **Natalia Picó**, Neuropsychologist
  4. **Rocío Sánchez-Carrión**, Neuropsychologist
- Institut Guttmann, Barcelona, Spain

### **INTRODUCTION/OBJECTIVES**

Various scales have been used to assess cognitive and neurobehavioural changes after Traumatic Brain Injury (TBI) including the Portland Adaptability Inventory (Lezak, 1980) and Neurobehavioural Rating Scale (Levin, 1987). Katz and Lysterly (1963) developed the Katz Adjustment Scale. The objective of this preliminary study was to determine psychological functioning in TBI patients, and examine the self and family point of view about the neuropsychological problems. Also we wanted to study if the initial severity of the lesions and the time since injury influences the results.

### **METHODOLOGY**

The Katz Adjustment Scale (KAS-R) was applied to a sample of twelve TBI patients and families. The patients had suffered moderate and severe damage. There was no previous history of psychopathology in patients and time since injury varied from 1 to 6 years. The results of each subscale of patients and family members and initial injury severity (GCS) with time since injury, using T Student Fisher statistics, was compared.

### **CONCLUSION**

Differences in scores between patients were observed in all the subscales, although only K1, K2 and K10 subscales was significant. There was no relation between initial severity (GCS) and later symptoms. In our sample the longer time since injury the more conscious the patients were of their condition. In Rehabilitation is necessary not only to focus on cognitive deficits but also on emotional changes because the neurobehavioural adaptation following TBI exerts considerable influence on outcome.

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## TRAUMATIC BRAIN INJURY IN CHILDREN. NEUROPSYCHOLOGICAL ASPECTS AND REHABILITATION

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  4. **Rocío Sánchez-Carrión**, Neuropsychologist
  3. **Silvia Sanz**, Occupational Therapist
  4. **Aranda Monserrat**, Physiotherapist
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### INTRODUCTION/OBJECTIVES

Traumatic Brain injury (TBI) in children has some different features from TBI in adults. The potential recovery of the immature brain is higher, however the brain damage in younger patients may interrupt the developmental process and future acquisition of skills (Goldman, 74; Prigatano, 93; Verger, 2000).

### METHODOLOGY

A revision of eight cases of children with severe TBI who are receiving treatment in the Child Rehabilitation Unit in the Guttmann Institut. We outlined the cognitive and behavioural semiology with emphasis on functional rehabilitation, social and familial reinsertion and school life.

### RESULTS/CONCLUSION

Cognitive deficits in our sample are consistent with previous literature: Deficits in attention, learning and memory with relative preservation in verbal functioning. Reinsertion to school depends on the level of neuropsychological damage.

After following a program of Rehabilitation we observed a positive evolution in motor functions and an improvement in independence in daily life activities.

From the study we recommend an extensive and multidisciplinary approach, guidance and support for the family and advice in schools and a progressive study

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## **A PAEDIATRIC ACQUIRED BRAIN INJURY COMMUNITY OUTREACH PROGRAM-BUILDING FROM THE GROUND UP**

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2. **Joy Sommerfreund**, OT, MEd, Thames Valley Children's Centre, London, Ontario, Canada
3. **Jane Gillett**, MD, FRCPC, Department of Paediatrics, University of Western Ontario, London, Ontario, Canada

### Objectives:

1. Participants will learn about the methodology utilized to bring grass roots input to the program development.
2. Participants will understand the Collaborative Model of Service Delivery.
3. Participants will learn about the uniqueness of this approach as well as lessons learned.

While advances in scientific technology and medical interventions have dramatically increased survival rates for the head injured paediatric population, more attention is now being given to the quality of the child's life after the illness and the impact such an injury has on the child and his/her family during the recovery process.

This poster will describe the development of a collaborative model for community outreach to meet the ongoing rehabilitation needs of children with acquired brain injury. The Paediatric Acquired Brain Injury Community Outreach Program in London, Ontario serves a large urban and rural population of 1.5 million people in Southwestern Ontario, Canada, covering a geographic area of 26,500 square kilometers. There are a number of smaller hospitals within the region, but none with the array of specially trained paediatric staff. The region's furthest smaller cities are one to three hours away from the tertiary centre and travel during winters months may be hazardous if not impossible. The program was intended to provide community based case consultation, local school and community training as well as peer to peer consultation.

Community input was essential to the success of this program. A community development process was undertaken which included site visits and focus groups with local providers, parents, teachers and other community members such as Police.

The final proposal was shaped by community input and included: creating community capacity; enhancing family ability and sense of empowerment; ease of access; collaboration with local providers and on going evaluation of the benefits and effectiveness of the program.



## COGNITIVE REHABILITATION UNIT SUNNAAS HOSPITAL (CRUSH) - DESCRIPTION OF A MODEL FOR THE VERY LATE PHASE REHABILITATION

1. *Kirsten Saether*, RN, Nurse
  2. *Sveinung Tornaas*, Psychologist
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### Objectives:

1. Describe a user oriented model for very late fase rehabilitation for people with aquired brain injury.

Acquired brain injury, including traumatic brain injury (TBI), stroke, and other types of brain damage, frequently results in significant long-term disability (1). Studies (2) have showed the need and potential for cognitive rehabilitation years after the injury. In Norway there hasn't been any specific programs in the late postacute phase. The CRUSH model is based on a psycho-educative approach, combining the users personal experience and knowledge with the professionals knowledge and experience. Inclusion criterions: people with ABI, cognitive sequelae as main problem, age 18 - 65, independent in ADL, stable medical condition and minimum 1,5 year post-injury. Exclusion criterions: Major psychiatric problems/substance abuse, progressive CNS disease, behavioural/language difficulties not compatible with group-participation. The model consists of three phases; the preparation phase, the inpatient phase (five weeks) and the follow up phase (one year follow up in their local community). The preparation phase: identification of goals on behalf of the participants and collection of baseline data (eg. cognitive status, subjective symptoms, health, coping, social networks, professional network). The inpatient phase: group sessions combining education, discussions and practical tasks. The relatives were invited to participate in parts of the programme. The follow up phase: the participant and his/her contact person worked together to reach the identified goals. Contact and collaboration with the local professionals was established. In addition: follow up data was collected after three months and one year.

This project is financed by a grant (10074) from the Norwegian departement of Health and Social affairs.

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## **FEASIBILITY OF AN ACUTE STROKE HOME CARE SERVICE FOR ELDERLY PATIENTS**

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**PURPOSE:** to assess the feasibility of hospital at home for elderly patients after ischemic stroke, to evaluate the hospital readmission rate and the requirement for long-term institutional care six months after stroke.

**METHOD:** the study was conducted on 120 randomized patients aged over 70 years (average age:  $81.6 \pm 7.4$  years), with ischemic stroke, admitted to the Emergency Department of our hospital: 60 patients were treated in the general medical ward (GMW), 60 were managed at home by the Geriatric Home Hospitalization Service (GHHS).

GHHS provides diagnostic and therapeutic interventions at home which are usually made in hospital. GHHS team includes geriatricians, nurses, physiotherapists, occupational therapist, speech therapist and social worker.

Patients were assessed on discharge, at 3 and 6 months after stroke.

**RESULTS:** the functional and cognitive recovery in survivors continued to occur within six months, in both groups. Mortality was not significantly different in the two groups.

Six months after stroke GHHS patients presented a more significant improvement in depression score evaluated by Geriatric Depression Scale-GDS (mean $\pm$ SD, GHHS patients  $8.4 \pm 6.3$ , GMW patients  $13.0 \pm 9.6$ ;  $p < 0.001$ ).

At follow-up, 95% of GHHS patients were still living at home versus 66.7% of GMW patients ( $p < 0.001$ ). Six months after discharge there was a significant difference between the number of hospital readmissions among GHHS patients and GMW patients (chi-quadro 24.3, df 2,  $p < 0.0001$ ).

**CONCLUSION:** GHHS is a possible alternative to routine hospital care and reduces the hospital readmission and the requirement for long-term institutional care for elderly patients with ischemic stroke.



## COMMUNITY CULTURES OF CARE FOR PERSONS WITH TRAUMATIC BRAIN INJURY

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  2. *Lorann Stallones*, PhD, Director
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### Objectives:

1. To study and describe the systems of care for individuals with traumatic brain injury in rural and urban communities in Colorado.
2. To work with communities in Colorado as they seek to improve their "culture" of care for persons with brain injury.

While many studies have described the ideal system of care for individuals with traumatic brain injury, little research has been published which describes actual "cultures" of care in individual communities.

**Design** - This ethnographic study examined one rural and one small urban community in the state of Colorado. Using guided interviews the researchers interviewed an exhaustive list of medical and community service providers in the two sites. Topics which were explored included types of services provided, the referral process, the assessment process, cultural concerns of services, next steps following services, follow-up with clients who have been discharged from services, and what networking among service providers takes place.

**Settings** - One small urban community of 110,000 people with a state university as its largest employer, and one rural mountain community of 15,000 people with a growing ski and recreation industry were studied.

**Results** - Both communities noted problems with lack of care coordination, lack of information about other available services, and large underserved groups (persons with mild brain injury, non-English speakers, and persons without health insurance). The rural community showed strengths in dealing with acute care, but had few resources for long-term rehabilitation, residential and community re-integration needs of persons with brain injury. Specialists were rare and much travel was required for appropriate services. The urban community, while possessing many appropriate services, had tremendous problems with referrals, primarily due to competition between providers. Both communities noted service gaps, and were enthusiastic to increase awareness of available services among providers and persons with brain injury.



## LATERALITY EFFECT IN PHONOLOGICAL AND SEMANTIC MEMORY OF CHILDREN WITH EARLY RIGHT HEMIPLEGIA

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3. *O.F.A. Bueno*

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Objectives:

1. Identify the pattern of brain reorganisation of the pre-school children as detected by phonological and semantic memory tasks, that is, whether a laterality effect or an interhemispheric reorganisation emerges years after precocious cerebral lesion.
2. Correlate this results with MRI.

**Introduction:** Brain reorganisation following early unilateral brain lesion is a controversial matter. Some authors have found interhemispheric reorganisation in which the right hemisphere is able to develop language and speech functions after left hemispheric lesions. Others concluded that laterality of functions is seen after early lesions. In a previous study we found a laterality effect in children with right hemiplegic cerebral palsy (RH-CP) on a phonological working memory task (PWMT) but not in an IQ test.

**Objective:** Identify the pattern of brain reorganisation of CP pre-school children as detected by phonological and semantic memory tasks, that is, if the laterality effect or whether an interhemispheric reorganisation emerges years after precocious cerebral lesion.

**Methodology:** Subjects were 35 CP children (21 boys), diplegic and hemiplegic (left and right) types, aged 4-6 years, matched to a control group in age and socioeconomic status. MRI showed generally lesion side compatible to the diagnosis. One or two lobes were affected (parietal and frontal or temporal), predominantly periventricular regions. Digit span (toward and backward), semantic verbal fluency (animals and fruits) and PWMT were assessed.

**Results:** MANCOVA, using age as covariant, showed a main effect of group Rao R (15,132)= 2,16;  $p < 0,01$  in that the RH-CP (left lesion) group was impaired in relation to control (Tukey;  $p < 0,05$ ) in all three tasks.

**Conclusion:** Phonological and semantic memory of RH-CP exhibited the pattern presented in brain-damaged adults in that the deficits were related to the hemispheric side of injury. These results suggested a hemispheric specialisation for specific memory skills.

SUPPORT: AFIP, FAPESP and CAPES  
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## COMPUTER-ADMINISTERED COGNITIVE REHABILITATION: FORAMENREHAB PROGRAMS

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2. *Sanna K. Koskinen*

Clinical Neuropsychologist, Licentiate in Psychology, Käpylä Rehabilitation Centre, Helsinki, Finland

Objectives:

1. To introduce an attempt to develop a method for cognitive rehabilitation as a part of a holistic approach.

The continuous challenge to neuropsychology is to develop new methods for assessment and rehabilitation, and the critical evaluation of these methods. Cognitive rehabilitation is traditionally considered an important part of rehabilitation of the brain injured patients. However, new viewpoints for the cognitive rehabilitation are to be set. Neuropsychological rehabilitation should address many facets of a brain injured individual, treat him or her in a holistic frame of reference with appropriate techniques and strategies for cognitive, emotional, and societal skills while increasing awareness and understanding of the new self. To quote George Prigatano (2000) "... new techniques for the remediation of disturbed higher cerebral functioning should constantly be under development, while still attending to patients' personal experiences and helping them adjust to their neuropsychological deficits in the context of interpersonal situations."

FORAMENRehab -cognitive software is a tool for cognitive rehabilitation to be used as a part of a holistic neuropsychological rehabilitation approach. The programs are based on the models and theories of brain functioning and recovery. The first FORAMENRehab module is designed for the disturbances of attention. Attention consists of different subsystems including focused, sustained, and selective attention on which the module is based.

FORAMENRehab software provides an easy to handle and efficient graphical user interface operating in Windows environment. The menu structure, toolbar and icons are illustrative and the help screens provide information, so the program is usable even without the help of the clinician. Each program has a clear written instruction on the screen as well as a model animation. The parameters of each program can be modified to adjust to a particular user. The results are presented both in written and graphical forms and can be printed. They can also be saved to file and compared with the previous results.

The first experiences of the applicability of FORAMENRehab software in Finnish TBI and stroke patients have been promising.



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## SYMBOLISM IN THE THERAPEUTIC PROCESS AFTER TBI

1. *Jaana Sarajuuri*, Clinical neuropsychologist
2. *Tarja Hämäläinen*, Specially trained nurse for psychiatry  
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### Objectives:

1. To discuss the role of symbols in the therapeutic process after TBI.

INSURE program is a six-week post-acute interdisciplinary rehabilitation program for TBI patients who have realistic chances of achieving productivity and psychological well-being if given special rehabilitation. The core of the program is neuropsychological rehabilitation and psychotherapy. It is based on the work of Prigatano, Ben-Yishay, and Christensen.

The psychotherapeutic process is vital for helping patients to achieve a sense of identity, to learn to behave in their own best self-interests, and to reconstruct life after brain injury. Neuropsychological psychotherapy in the INSURE program is conducted in individual and group formats during which injury-related pathophysiological, neuropsychological and neurobehavioral aspects of TBI, as well as personal reactions, coping and psychosocial adjustment, are tackled.

Various artistic expressions can be used to facilitate the psychotherapeutic process. Symbolism e.g. in songs, stories and pictures can have an enormous impact on patients. Symbols express a combination of cognitive and affective reactions. They may also convey ideas and feelings that cannot be put into simple words. After brain injury symbols can enhance a better understanding of patients' phenomenologic experiences and help them to cope with the issues of meaning in their lives. Symbols can be used as projective techniques and they can offer prognostic clues in the course of rehabilitative work.

In the Pictures-of-Self workshop in the INSURE program patients express their emotions, experiences and visions of themselves and their lives by means of collages. These can be made of different materials e.g. photos, fabrics, mosaic etc. In a collage patients can convey their experiences of childhood, family, achievements, the accident, the losses resulting from the injury, confusion and sorrow related to the injury, and successes in coping.

As patients review their presentations, they can gain a better insight and monitoring into their lives which can help them further diminish their confusion and the psychological stress related to the injury and its consequences. In the poster some collages and their symbolic representations as experienced by the patients are presented.



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**PERCEPTIONS OF SOCIAL SUPPORT AND QUALITY OF LIFE: MEN AND WOMEN DO NOT AGREE**

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  2. *Jean Basom*, BSN MBA
  3. *Oralee Nudsen*
  4. *Christian G. Zimmerman*, MD FACS
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Objectives:

1. Identify gender specific elements that constitute social support and quality of life.
2. Investigate gender differences in perspectives that could affect TBI recovery.

Social support is an important consideration when attempting to understand the TBI recovery process. Although the concept of social support is difficult to thoroughly identify and quantify, even simple heuristic measures illustrate the important relationship shared by recovery and social support. Quality of life plays a significant role for all associated with TBI. This concept is also difficult to define. Glimmers of interesting gender differences revealed in research in these areas prompted us to investigate further. We administered structured interview questionnaires to participants in a longitudinal TBI study to investigate levels and concepts of QL and SS. The questionnaires consisted of open-ended and Likert-rated questions (23 QL and 30 SS). Eleven researchers conducted the interviews to control for interviewer bias. We interviewed 34 participants (males N=20, females N=14) for SS and 25 participants (males N=15, females N=10) for QL and analyzed the data using Spearman's rho, gamma, regression analysis, Chi square, and Kendall's tau. We found distinct differences among men and women. Men reported overall greater post-injury QL and identified specific elements constituting QL. In contrast, women reported poorer QL and did not identify particular components. Conversely, women identified elements of satisfactory SS, while men did not. We report factors specific to each gender that can enhance or diminish SS and QL. Providing treatment with gender consideration has the potential to improve the recovery process and resultant outcome level.



## **A MODEL FOR SUPERIOR RECOVERY FROM SEVERE TRAUMATIC BRAIN INJURY**

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  3. *Jean Basom*, BSN MBA
  4. *Christian G. Zimmerman*, MD FACS
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### Objectives:

1. Develop a model to promote TBI recovery.
2. Illuminate characteristics that facilitate recovery.

Every day in hospitals throughout the world people are struggling to emerge from the nightmare of TBI, which instantaneously changes the life of the patient and his/her family. The road to recovery is long and arduous. Those recovering from TBI must deal not only with physical pain and trauma, but also with a perceived loss of self. We have designed a model to facilitate this struggle for recovery emphasizing the case studies of four people who sustained severe TBI and achieved superior recovery. Additionally, the model was derived from case studies of 199 TBI patients who achieved varying levels of recovery. The model begins with pre-injury characteristics the person may develop further: Personal Hardiness (positive self-image, assertiveness, high achiever, views change as challenge); Spirituality (has a spiritual belief system); Autonomy (independence, positive self-worth); and Perspective (views life and its occurrences as a cherished gift filled with lessons that encourage personal growth). The next layer focuses on important traits for the recovery process: Patient as Individual (is treated as an unique individual rather than as a generic patient); Positive Support Systems (has a positive and consistent support network available); Traditional and Nontraditional Approaches (is not limited to one treatment modality); and most important, Active Role (takes an active role in treatment and recovery). Throughout the person's life a Possibility Focus (sees range of options rather than defeat, is optimistic and hopeful) is essential. Our goal in constructing the model is to convey the array of factors that facilitate recovery along with those that do not.



## **INTEGRATION SYSTEM OF REHABILITATION IN WOUNDED WITH TBI - THE MAJOR PROBLEM OF MILITARY AND CIVIL MEDICINE**

*V.M. Shklovsky*, Prof., Chief of Neurorehabilitation Centre, Moscow, Russia

The neurorehabilitation in patients with focal brain imparities cannot be treated separate from the general treatment and rehabilitation of stroke or TBI, since there appears a number of identical issues in differential diagnostics and in the significance of the right and left hemisphere imparities and their consequences, in the peculiarity of disorders; and finally in the organization of the structured aid to patients at different stages of disease that provide sequence of military and civil medicine.

The stroke and TBI neurorehabilitation differs from cardiac, surgery, and other rehabilitation. This is due to the imparities in the dominant hemisphere that lead to speech and other higher mental disorders and as a rule cause the right side hemiparesis. Besides, most of them suffer from psycho disorders related to vascular or trauma brain pathology, or as a reaction to the defect, or changes in social or family status. These are young and middle age people up to the age of 50. According to our data Transport TBI comprises 26.8%, Every-day - 33.3%, Criminal - 20.9%, Sports - 2%, Industrial - 3.2%, War - 9.8% (suffered from the wars in Afghanistan, Tadgikistan or Tchechnya). It is worth stating that motion disorders are better restored within the first year after TBI, though speech and higher mental disorders better improve 2-3 and more years after TBI. Since 1968 we have established specialized network at 90 health care facilities in Moscow (at the neurological and neurosurgical emergency hospitals, at in-home hospitals, at day-care clinics and at local clinics led by the Centre of Speech Pathology and Neurorehabilitation). This network appeared mostly prepared to render adequate aid to military men with TBI.



## THE USE OF ANTIGRAVITATION FITTINGS FOR MOTIONAL FUNCTIONS CORRECTION IN TBI PATIENTS

1. *V.M. Shklovsky*, Prof., Chief of Neurorehabilitation Centre, Moscow, Russia
2. *E.D. Mamitcheva*, Moscow, Russia

The local antigravitation fittings borrowed from the space medicine were successfully used in rehabilitation of cerebral palsy children; and that permitted to use them in treatment of TBI patients. Theoretically it is useful to radically stimulate afferent support systems of pose and motion and that helps to restore motion.

**Goal.** To study the effect of wearing antigravitation fittings in patients with motion and higher mental disorders after TBI.

**Object and Methods.** We treated 120 patients sick from 6 months to 3 years. These patients suffered from the focal brain imparity with motion disorders in the form of the right side hemiparesis as well as with higher mental disorders, including speech. The basis for selecting patients served the lack of positive results in motion and speech to the already conducted in-hospital treatment. It consisted in daily wearing the fittings from 30 minutes up to 2 hours for 20 days. The patients were to walk up and down the stairs.

**Results.** All patients demonstrated positive dynamics in neurological status (reduced pyramid syndrome, lower spasticity and hyperreflexia, growing of the muscular strength, lower vegetative and trophic disorders of skin and bone-muscular paretic arms and legs). The patients broadened the range of skills in self service with their injured arms and legs; they started to walk more confidently. They also demonstrated essential improvement in higher mental functions (memory, speech, reading, counting, attention and others). The results of neuropsychological testing and neurophysiological investigations confirmed positive clinical effect.

**Conclusions.** The facts obtained permit to recommend the method of dynamic proprio correction with the used antigravitation fittings as part of complex rehabilitation in patients after TBI.



## THE PRINCIPLES OF NEUROREHABILITATION OF THE WOUNDED AND THE PATIENTS AFTER TBI AT IN-HOME AND DAY CARE CLINICS AS PART OF NON STOP RESTORATION TREATMENT

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2. *U.A. Fukalov*, Centre of Speech Pathology and Neurorehabilitation, Moscow, Russia
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4. *T.I. Biljukova*, Centre of Speech Pathology and Neurorehabilitation, Moscow, Russia

In military and civil medicine the most clinically complicated are the wounded and the patients after severe TBI who have dominant hemisphere damaged and higher mental functions (HMF) including speech disordered. They also suffer from the right side hemiparesis. High effect of neurorehabilitation in such patients can be reached only if rehabilitation starts very early; if the patient's somatic, neurological, psychic and psychological state is under systematic control; if continuity, duration and complexity of rehabilitation at every stage is ensured; if social, psychological, every-day-life, and labor problems are solved and if the family is involved in the program at every stage of the disease.

If the patient can not move and fulfill hygiene functions on his own after emergency hospital or after neurosurgery he is treated at in-home clinic under observation of the neurologist, therapist and psychiatrist who pay special attention to the restoration of motion, self service skills, speech and other HMF. The course of treatment is 3-4 months long. 1796 patients have been treated at in-home clinic for 5 years, more than 3% of them are TBI patients; as a result of treatment significant improvement of motion and HMF is observed in 23% of cases and improvement in 70%.

The day-care clinic is the next stage in neurorehabilitation. Such clinic is attended by the patients whose physical and psychological state allows them to move about the city on their own. At this stage the stress is made on social, every-day-life and labor adaptation. The day-care clinic prevents the development of hospital syndrome. This course is 90 days long and the patient visits the clinic from 2 to 6 times a week. Out of 145 TBI patients 19.4% of patients returned to work, 28% demonstrated essential HMF and motion improvement and 48% showed improvement.

Thus specialized medical care (day-care clinic, in-home clinic and emergency hospital) provides integrity, continuity and stages in neurorehabilitation after TBI.



## **THE ROLE OF NOOTROPS VASOACTIVE MEDICINES IN NEUROREHABILITATION AFTER TBI IN PATIENTS WITH HIGHER MENTAL DISFUNCTIONS AT DIFFERENT AGE**

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2. *O.A. Koroleva*, Center of Speech Pathology and Neurorehabilitation, Moscow, Russia
3. *O.V. Rudneva*, Center of Speech Pathology and Neurorehabilitation, Moscow, Russia

Prognosis and efficacy of neurorehabilitation (NR) after TBI is an actual theme of nowadays medicine, as we can meet TBI at any age. In childhood this problem is mostly important because of early disability. When dominant hemisphere is damaged motor disorders are followed by higher mental disfunctions, including speech, that's why person has more hard situation with social adaptation, family tragedy; in childs and adolescents there are problems in studying and getting occupation.

**Goal:** investigate the most effective ways of NR.

**Objects and methods:** Where observed 150 patients with TBI, 28 children among them (up to 12 y.o.). These were patients with damaged left hemisphere after TBI. The status was examined by neurological and neuropsychological scales. Komplex NR: pharmacotherapy (including cerebrolyzine, nimotop, instenon), physiotherapy, physical training and massage, psychotherapy (individual, in group and special accent in family), individual and group speech-therapy, reflexotherapy, occupation therapy etc.

**Results:** 98% patients accept higher mental disfunctions had encephalopathy, liquorodynamic, vegetative, vascular, hyperkinetic disorders. Neuropsychological testing at different stages of disease showed the stable improvement in speech and, movements, and odd to pharmacotherapy - increasing of day-activity, concentration of attentivness and decreasing of behaviour disorders. All these effects came more clearer and quicker in children.

**Conclusion:** Nootrop Cerebrolyzine and vasoactive preparations Instenon and Nimotop can be recomended in wide practice of NR in TBI patients with motor and higher mental disfunctions at different ages.



**EVENT RELATED POTENTIALS IN YOUNG PATIENTS WITH FAVORABLE OUTCOME AFTER TRAUMATIC BRAIN INJURY**

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2. **L. Fraioli**, EEG Technician, San Raffaele-Cassino Clinic, Tosinvest Sanità, Cassino, Italy
3. **S. Giaquinto**, Professor, San Raffaele-Pisana-Roma Clinic, Tosinvest Sanità, Cassino, Italy

There is a constant need to find proper means of prognostic value after traumatic brain injury (TBI) (1) Event related potentials such as the P300 have been already used for that purpose. The study is aimed at evaluating the difference if any between the passive and active modality. Ten patients were enrolled with a Glasgow Coma Scale median value of 9.5, range 7-11. Their mean age was 24.2 years (s.d.3.1). All of them had a favourable outcome (Glasgow Outcome Scale median value: 2.2, range 1-2). DRS had a median value of 23.5 (range 19-24). P300 was recorded twice, respectively at baseline and after 4 months. The latencies of P300 obtained with passive modality were, respectively, 418 ms (30.4) and 364 ms (20.5). The difference was significant (P 0.04). Viceversa, the latencies with active modality did not change significantly. They were 407 ms (sd 33.5) at baseline and at 394 (sd 34.6) after 6 months. In no case amplitude analysis gave significant differences. However, in the passive modality a trend could be observed, because the mean amplitudes were respectively 6.5 (sd 5.9) and 11.3 microvolts (s.d. 3.9). Therefore, at least in patients with favourable outcome, the passive modality is recommended. Instrumental monitoring of TBI patients should not be redundant, otherwise non significant results are collected



## EVALUATION OF TRAUMATIC BRAIN INJURY PATIENTS THROUGH PROTOCOLS BASED ON EVIDENCE BASED MEDICINE

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The research confronts the problems concerning the rehabilitation of traumatic brain injury patients, in accordance with the medicine based on evidence (1). At the moment, in fact, for what concerns rehabilitative procedures, the points of reference are experience, usual procedures, more than on an activity based on scientific evidence. Therefore the main aim is to define and standardise a rehabilitative protocol for skull traumas based upon scientific evidence. Such protocol will constitute the instrument to evaluate the patient.

To accomplish such aim it is appropriate:

To deepen the description of the population with TBI (Trauma Brain Injury), Specify the studies or the added therapies (medical, neuro-psychological, ecc.), in order to formulate specific levels of evaluation;

Produce a common instrument to be used by every operator interested in the rehabilitative processes on both a national and international level.

For what concerns the diagnostic phase, there is a constant need to search for the right diagnostic means after a TBI. Potential events correlated like P300, for example, have already been used for such aim. A proper study which evaluates if there are any differences between workable active and passive modality could evaluate the use of such diagnostic mean during the treatment of a patient with TBI.

Finally in the therapeutic phase, seems important to harmonise the necessary competence (neurological, cardiology, internist, psychiatrics) and the development of a protocol would make such co-operation easier. In order words this instrument would facilitate the decisions concerning the improvements of TBI patients for what concerns different phases of the treatments.



## BRAIN INJURY: A NEW MODEL FOR VOCATIONAL TRAINING

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2. **Catia Albertazzi**, Educationist, Ausl Bologna, Italy
3. **Giuseppe Pellegrino**, President, Didacta Onlus, Bologna, Italy
4. **Roberto Piperno**, MD, Ospedale Maggiore Bologna, Italy

### Objectives:

1. To create a new model for vocational training directed at those with acquired disabilities.
2. To create and research flexible and semi-autonomous training methods involving regular tutoring.

In recent years there has been a significant increase in cases caused by acquired handicaps, those handicaps resulting from accidents or degenerative illnesses. Young adults between 15 and 24 are the age group most at risk. In this sector the brain injury is an acquired handicap that is increasing in an alarming manner and as yet no specific vocational training models have been developed in our country. The aim of this project is to create a model for vocational training, focusing into innovative methods of combined and early action between hospital, social services and vocational training Agencies for the disabled. This is a significant innovation of this project because of holistic approach to the disabled person. This project is addresses to people who will be able to obtain qualification through the new model of vocational training. The following main phases have been identified:

- the setting up of the team with active participants, and the definition of the methodology for collaboration among team member;
- the definition of the means of interaction among the various team members;
- screening performed by the team to evaluate potential users of the service. On the bases of the information obtained, the needs of each patient will be defined and appropriate individualised programs will be set up, identifying and applying specific teaching strategies and adequate computer support;
- setting up of programmes to provide training and information to those working in the field of rehabilitation, whit the aim of disseminating the method developed in the near future.

At the present good results are being obtained in the development and experimentation of this model for vocational training in the rehabilitation of subjects with acquired disabilities.

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## CRUSH, A LATE PHASE REHABILITATION PROGRAMME - FROM THE PARTICIPANTS POINT OF VIEW

1. *Annette Holth Skogan*, Psychologist
  2. *Sveinung Tornaas*, Psychologist
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### Objectives:

1. To identify what factors in the rehabilitation programme that are viewed by the participants as most important.
2. To investigate whether the participants themselves describe any lasting changes due to the program.

In this study we investigate how a late phase rehabilitation programme developed by CRUSH is evaluated by its participants. The programme was psycho-educative oriented, and consisted of a five week inpatient group based period, then 1 year follow-up in the local community.

Data were collected by interviews from thirty persons with an aquired brain injury, aged 25-65 (mean = 45). All had gone through the rehabilitation programme in question, the last group finishing their one-year follow up in November 2000. Diagnoses represented where TBI, stroke and other types of aquired barin damage. Average time post-injury was approximately 7 yrs. All participants where independent in daily living, about 50% lived with partner/spouse. Mild to moderate cognitive impairment represented their major sequelae.

1. A majority reported that participation in the programme made a significant positive change in their life-situation. The most important factors were reported to be: a better understanding of the consequences of the injury, better ability to explain to other people what has changed and the realization that there are other people that experience similar difficulties.
2. The positive changes where still reported after one year and attributed to similar factors.

By exploring the participants' evaluations of the rehabilitation programme we point out some considerations that might be important when developing late phase group based interventions.

This project is financed by a grant (10074) from the Norwegian departement of Health and Social affairs.



## PROJECT “SOCIAL NETWORKS FOR PERSONS WITH TBI”

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2. *Eli M. Killi*

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### Objectives:

1. Building social networks.
2. Information and education about living with TBI.

### Background

“Social networks for persons with TBI” is a project funded by “Health and Rehabilitation” and “National Association for victims in road accidents” in Norway, in cooperation with Øverby Resource Centre who runs this project. Øverby Resource Centre is part of the National Supportsystem for Special Education in Norway for persons who have sustained acquired brain injury (ABI). The employees constitute a cross-disciplinary team consisting of special educators, psychologists, social educators, occupational therapists and physical therapists.

The project was established in 1998 and will be run until the end of 2001. Its main objective is to develop social networks through organizing social stays where children, young people and adults and their families and caregivers can meet for support and education about living with traumatic brain injury (TBI).

### Project

So far this project has run 6 meetings/stays lasting for 3 days where 84 persons have participated, 39 with TBI and 45 familymembers and caregivers, from all over Norway. The age range from 5 to 53 years old, divided into 4 agegroups. The reports have been positive from all the participants and they all express a need for coming together for support and information/education. Working in this project as professionals have given us valuable knowledge about the social and educational needs in this group

- 3 models have been tried out.

Øverby Resource Center: Social stays and education onTBI given by Øverby’s cross disciplinary team.

Fjellheimen, an outdoor pursuits center: Activities and outdoor adventures..

Gurvika, a holiday resort for disabled people: Social stays

- A video is under production for educational purposes.

- Parents have as a result of meeting each other in this project founded a division within the “National association for victims in road accidents” aiming at working for the benefit of children/young people with TBI and their families.

### References:

- *Egil Larsen, Manager of Acquired Brain Damage Dep, Øverby Resource Centre*

## ADAPTED TECHNOLOGY ENRICHING QUALITY OF LIFE. LOCKED-IN SYNDROME

1. *Sinikka Söderholm*, Speech and Language Pathologist/Head of Unit
2. *Monica Meinander*, Occupational Therapist
3. *Hannu T. Alaranta*, MD, PhD/Director

National Association of the Disabled in Finland, Käpylä Rehabilitation Centre, Helsinki, Finland

### Objectives:

1. Locked-in syndrome.
2. Augmentative and alternative communication methods.
3. Quality of life.

The development of information technology has made it possible for severely injured persons to find new user-friendly alternatives to access the computer.

Locked-in syndrome (LIS) is a neurological condition due to a brain disease or an injury affecting the brain stem. The symptoms are tetraplegia, doublesided facial paresis, anarthria/dysarthrophonia, dysphagia and reactive involuntary laughing and crying. Vertical eye movements are the only commonly remaining voluntary motor function.

Although the linguistic abilities as well as intellectual and emotional functions as a whole remain intact, all the motor abilities of self expression are lost. Seventeen (17) chronic locked-in syndrome (LIS) patients referred to Käpylä Rehabilitation Centre between 1979 -2000 with regular follow-ups are reported. During their rehabilitation the multidisciplinary rehabilitation team developed an individual alternative communication method or a computer based communication method for all seventeen (17) patients and trained them to use it by minor movements of e.g. thumb, chin or head.

Locked-in patients have been in a way “cinderellas” of the medical world, quite a rare and partially forgotten group. The symptoms of locked-in syndrome are often misunderstood. When a person has lost practically all capabilities for voluntary activity, it is of vital importance to do everything to improve his/her life, however small the steps might be. Interaction with one’s environment is one of the basic needs and most important for improving the patients’ quality of life.

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**CULTURALLY SENSITIVE PRACTICE: PAEDIATRIC ACQUIRED BRAIN INJURY COMMUNITY OUTREACH IN THE RURAL MENNONITE CULTURE - CASE STUDIES IN NON-TRADITIONAL (CREATIVE) REHABILITATION AND COMMUNITY REINTEGRATION**

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Objectives:

1. To illustrate through case study, non traditional rehabilitation in a geographically isolated area with a culturally specific group.
2. To illustrate through case study, a collaborative and family centred approach to community reintegration following acquired brain injury.

The Paediatric Acquired Brain Injury Community Outreach Program is an innovative program that was designed for the purpose of providing community based support to children and adolescents with acquired brain injuries in five counties of Southwestern Ontario, Canada. This is a large and diverse geographic region with an extensive rural population often isolated and without access to traditional rehabilitation programs. Within this region there are a number of Old Order Mennonite Communities living a separate cultural and religious lifestyle. There is often no running water or electricity and they travel by horse and buggy. There is limited access to Tertiary care centres where specialist care is provided. There is limited contact with the general population surrounding these communities. Their school system is self-contained and young adolescents finishing school at the age of 14 are then expected to assume a working position within the community helping on the farms or with general chores and the raising of children. They also do not subscribe to the provincial health care insurance allowing for coverage of hospital and rehabilitation costs. Our Program has been privileged to work within the Mennonite Community to collaboratively develop meaningful rehabilitation programs and support community reintegration for a number of children with acquired brain injuries. Two case studies will illustrate and detail the process of rehabilitation and community reintegration with a 14 year old boy and a 16 year old girl with acquired brain injuries. The case studies will illustrate the culturally specific issues and how rehabilitation and follow-up medical care was provided in collaboration with the family and the community at large outside the traditional rehabilitation model. Where traditional rehabilitation models and strategies were inappropriate, this poster will illustrate how our Team was able to work within these communities to develop culturally sensitive and meaningful rehabilitation plans to enable successful and supportive reintegration. Case studies outlining the injury, transition from hospital to home and the reintegration into the community will be presented.



**PAEDIATRIC ACQUIRED BRAIN INJURY COMMUNITY OUTREACH PROGRAM (PABICOP): AN EVALUATION STUDY**

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2. **Ellen Rosen**, RN, MScN, Manager, Children's Services, Children's Hospital of Western Ontario, London, Ontario, Canada
3. **Jane Gillett**, MD, FRCP, Paediatric Neurologist, Medical Director, Paediatric Acquired Brain Injury Community Outreach Program, London, Ontario, Canada
4. **Janette McDougall**, MA, Research Associate, Thames Valley Children's Centre, London, Ontario, Canada

Objectives:

1. Participants will learn about a paediatric community outreach program in southwestern Ontario, Canada (PABICOP).
2. Participants will become familiar with the design of a research study aimed at measuring the effectiveness of PABICOP.

This poster will present a study currently underway that has been designed to evaluate the effectiveness of the PABICOP program. PABICOP is a community outreach program that provides a comprehensive continuum of care to children and youth with acquired brain injuries (ABI). Ultimately, the goals of PABICOP are to improve community integration and acceptance of children and youth with ABI, and improve overall quality of life for the children and youth and their families.

The specific objectives of PABICOP are: to improve knowledge about ABI among primary caregivers; to facilitate the primary caregiver's sense of empowerment in the rehabilitation process; to foster successful integration of the child or youth back into the family and the community; to reduce post-injury behaviour problems for children and youth with ABI; to reduce the injury-related burden among families of children and youth with ABI; and to foster positive family functioning.

The primary aim of this study is to evaluate the effectiveness of PABICOP in achieving the program objectives. A secondary aim is to examine the process by which the PABICOP team provides services and parent and teacher satisfaction with services provided. The study uses a nonequivalent comparison group quasi-experimental design. Standardized measures are used to assess outcome at three time points (at pretest, three months later, and one year following pretest). The evaluation study seeks to involve 144 children or youth with ABI (72 experimental, 72 control) and their families. The study began in July, 2000 and will be completed by July, 2003.



## **POTENTIAL UNLIMITED: DID THIS PILOT PROGRAM FACILITATE ADJUSTMENT TO BRAIN INJURY?**

*Matt Thomas*, Psychologist, Southern Area Brain Injury Service, Goulburn, Australia

Objectives:

1. To explore and evaluate the efficacy of this pilot Potential Unlimited Program in facilitating adjustment to brain injury.
2. To examine changes in Potential Unlimited Program participant's self esteem and quality of life.

In December 1998 the Southern Area Brain Injury Service in conjunction with Outward Bound Australia launched a programme that became known as the Potential Unlimited Programme. This programme involved adults with brain injury completing an Outward Bound "Discovery" course and four months of follow-up group work, with the aim of improving participant's self esteem and quality of life.

This pilot study aimed to explore and evaluate the programme in relation to Simpson's four tasks of adjustment to brain injury. A mixed qualitative and quantitative design saw six experimental group participants and eight comparison group participants complete O'Brien and Epstein's Multi-dimensional Self Esteem Inventory and Frisch's Quality Of Life Inventory on four occasions over two years. Participants who completed the programme were also interviewed at the end of three months of Follow-up group work.

Results showed that participants made significant and lasting gains in key areas of self-esteem and quality of life. The program was shown to have made a significant impact on participant's lives by facilitating adjustment to brain injury.

Several brain injury rehabilitation services have expressed interest in facilitating future programs. Ongoing research and development of the programme is in progress.

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## TREATABLE VEGETATIVE STATE: LONG-TERM FOLLOW-UP RESULTS OF DEEP BRAIN STIMULATION

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2. *Takamitsu Yamamoto*, MD, PhD
3. *Yoichi Katayama*, MD, PhD

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Objectives:

1. Make sure the criteria of treatable vegetative state.
2. Long-term follow-up results of deep brain stimulation in vegetative state.

**Purpose:** We evaluated the vegetative state (VS) patients in neurological and electrophysiological methods, and compared with the long-term follow-up results of deep brain stimulation (DBS) therapy.

**Method:** Twenty cases of complete VS, which correspond to the criteria reported by The Multi-Society Task Force on PVS in 1994, and five cases of incomplete VS, which show emotional expression, visual pursuit or blink in response to visual threat, were treated by the DBS therapy. CM-pf complex (23 cases) and mesencephalic reticular formation were selected for the stimulating points of DBS therapy, and followed-up at least 7 years. Neurological and electrophysiological evaluations were made three months after the onset of the cerebral injury.

**Results:** With respect to the long-term prognosis, all of five patients in incomplete VS completely recovered from the VS after DBS therapy, and three of them became able to walk independently. Among the twenty patients of complete VS, seven patients regained the ability to communicate with others. However, these cases remained bedridden even after the long-term follow-up. Electrophysiological evaluations, which include continuous EEG frequency analysis, auditory brainstem response, somatosensory evoked response, and pain-related P250, were useful to differentiate the candidate for the DBS therapy in complete VS.

**Conclusion:** It is concluded that deep brain stimulation can be effectively used for achieving recovery from the VS by checking the patient's neurological status and undertaking electrophysiological evaluations. However, special rehabilitation program may be necessary for the patients who recovered from the complete VS.



## OPEN-LABEL STUDY OF DONEPEZIL IN TRAUMATIC BRAIN INJURY

1. **Robert van Reekum**, MD, FRCPC, Baycrest Centre for Geriatric Care and University of Toronto, Ontario, Canada
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3. **Mark T. Bayley**, MD, FRCPC, Hamilton Health Sciences Corporation, Hamilton, Ontario, Canada
4. **Martine Simard**, PhD, Université de Moncton, Nouveau Brunswick, Canada

### Objectives:

1. To inform the audience as to these preliminary and promising results into the efficacy of donepezil for memory impairment after TBI.
2. To encourage further research into the role of donepezil, and related compounds, in TBI.

**Objective:** To preliminarily determine whether donepezil will improve memory, behaviour and global function following chronic traumatic brain injury (TBI).

**Design:** 16 week open label study.

**Setting:** Outpatient TBI rehabilitation program.

**Patients:** 4 patients with chronic severe TBI.

**Interventions:** Donepezil 5 mg daily for 8 weeks followed by 10 mg daily for 4 weeks.

**Main Outcome Measures:** Memory measures included the Rey Auditory Verbal Learning Test (RAVLT), the Complex Figure Test (CFT), items from the Rivermead Behavioural Memory Test and a Semantic Fluency Task. The Neuropsychiatric Inventory evaluated behaviour and affect. Function was assessed using the Functional Independence Measure and a clinical global impression of change.

**Results:** On the RAVLT the mean scores for learning, short term and long term recall improved by 0.4, 1.04 and 0.83 standard deviations above baseline, respectively. On the short term recall of the CFT the mean score improved by 6.25 points above baseline and there was a gain of 0.77 standard deviations above baseline on long term recall. A positive trend was observed on the Rivermead Behavioural Memory Test and on subscales of the Neuropsychiatric Inventory.

**Conclusions:** Donepezil may improve some aspects of memory and behaviour in persons with chronic impairments post-TBI. Randomized clinical trials are required to further support these preliminary findings.



## ECOLOGICAL APPROACH TO THE REHABILITATION OF A GIRL WITH TBI: QUALITATIVE ASSESSMENT OF VISUOSPATIAL DISABILITIES

1. **Mauro Ventura**, Speech Therapist, Educationalist, "Bambino Gesù" Hospital, Palidoro, Roma, Italy
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3. **Marcello Mario Pierro**, Head of Department of Pediatric Rehabilitation, "Bambino Gesù" Hospital, Palidoro, Roma, Italy

### Objectives:

1. Checking if the form of qualitative assessment that we propose in this paper can be useful to define the causes of specific visuospatial disabilities of a girl with traumatic brain injury.
2. Assessing if the rehabilitative intervention has been followed by an improvement of the visuospatial performances and especially by a better level of the girl's environmental adaptability.

A research or a rehabilitative intervention, in order to be defined as ecological, should satisfy three conditions: concerning tasks and conditions that really appear in everyday life, studying the individual in his cognitive, emotional and affective wholeness, giving results immediately usable for a change of the inter-relationship between the individual and the environment.

This single-case study has the purpose of the adoption of an ecological approach in the rehabilitation of a girl affected by T.B.I.

Some difficulties in visuospatial tasks, which were a significant impediment in the everyday life activities, have been analysed by integrating neuropsychological tests, observations on behavioural and functional efficiency, and qualitative assessments of a clock drawing task, whose particular version is presented.

The results of the three assessments done (40, 70, 100 days from T.B.I.) and the organised rehabilitative activities are reported.

### Targets:

- checking if this form of qualitative assessment can be useful to define better the causes of the specific disability
- assessing if the rehabilitative intervention, organised on the basis of the qualitative analysis, has been followed by an improvement of the same performances and especially by a better level of the girl's environmental adaptability.



It is possible to affirm that:

The rehabilitative activity has been followed by the girl's improvement on neuropsychological outline, impaired visuospatial tasks, and behavioural and functional efficiency.

The qualitative assessment of the visuospatial disabilities has resulted useful to explain the difficulties causes; specifically the clock drawing task can be considered a simple and quick instrument to be used.

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## FUNCTIONAL OUTCOME AND INSTABILITY OF NEUROBEHAVIORAL FACTORS IN TBI SUBJECTS

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Recent literature pointed out a strong relationship between neurobehavioral deficits and general functional outcome in TBI subjects. The aim of this study is to identify which kind of behavioral modifications can impact on community integration after severe TBI.

We considered a sample of 46 TBI subjects previously involved in a rehabilitation program in our Centre. In order to obtain neurobehavioral assessment and functional outcome measure we submitted NECHAPI1 and CIQ2 to patients' close relatives. Questionnaires were administered in a double form: one as measure of pre-traumatic behavior (collected retrospectively), and the second as post-traumatic outcome.

An overall comparison showed a statistically significant worsening of scores in two NECHAPI factors, *Emotional Vulnerability* and *Sociability*. Post-traumatic CIQ results replicated literature findings, with lower *Social Integration* and *Productive Activity* scores.

According to León-Carrión<sup>1</sup> methods, we compared pre- and post-injury NECHAPI scores for all patients, looking for those cases who met "instability" criteria for each factor. Our hypothesis was that any instability in one or more factors can lead to a significant change in CIQ score. Results showed that the group of "instable" patients for factor 3 (*Emotional Vulnerability*) reached a difference between pre- and post-traumatic CIQ score significantly larger than "stable" group, due to worsening in *Social Integration* variable. No other NECHAPI factor seem to influence CIQ scores. The *Productive Activity* CIQ score responded only to a concomitant instability of at least three different NECHAPI factors, and we explained this result with the complexity of this variable.

This study can lead to conclusions with clinical implications as well as helping identifying the behavioral abilities involved in community integration and consequently areas that need most consideration during rehabilitation treatment.

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## **BRIEF COMPUTERIZED COGNITIVE TEST BATTERY YIELDS OBJECTIVE EVIDENCE TO INFORM CONCUSSION GUIDELINE DEVELOPMENT**

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3. **Kenneth Cameron**, M.A., ATC., Certified Athletic Trainer, United States Military Academy, Westpoint, NY, USA
4. **LTC James Ecklund**, MD, Chief of Neurosurgery, Walter Reed Army Medical Center, Washington DC, USA

### Objectives:

1. To introduce the utility of within subject comparison of baseline and post-injury computerized neuropsychological baselines testing in the evaluation of athletes after concussion.
2. To demonstrate the potential usefulness of simple reaction time, rather than tests of higher cognitive function, as a sensitive measure after very mild sports concussion.

**Background:** Existing sports concussion guidelines were developed largely by clinical judgment and are not yet fully linked to objective evidence of deficits that persist after injury. We hypothesized that a brief onsite computerized screen of cognitive function could aid assessment of immediate deficits and the recovery process.

**Methods:** 438 U.S. Military Academy (USMA) cadets received computerized neuropsychological testing prior to starting a physical education boxing program. Certified athletic trainers retested concussed students within 1 hour of injury and again 4 days later at the time of return to full activity. The established concussion management system at USMA requires a 4 day pass from contact sports for all cadets experiencing concussion with physical symptoms lasting no more than 20 minutes. If symptoms persist after 20 minutes, additional medical evaluation is completed and the pass is extended. Two-tailed t-tests were used to compare follow-up and baseline scores of the concussed group.

**Results:** 14 cadets experienced a mild concussion without loss of consciousness or amnesia and reported no physical symptoms upon return to normal activity 4 days later. Using AAN concussion guidelines, 8 cadets experienced Grade 2 concussion, the other 7 were Grade 1. All cadets were classified as Grade 1 by Colorado guidelines. All cadets showed slowed reaction time immediately and 4 days after injury on the Continuous Performance and Simple Reaction Time tests. Tests involving more complex cognitive functions showed no significant change after concussion.



**Conclusions:** In mild sports concussion, tests of basic attention are more sensitive to concussion than tests requiring complex mental processing. Although all cadets were asymptomatic and had returned to normal activity on day 4, they still had slowed reaction time. Brief computerized cognitive tests such as ANAM, when combined with the computer classrooms available at many schools, make it possible to baseline large numbers of athletes rapidly and inexpensively. The large scale use of this technology to establish within-subject baselines should enable the collection of scientific evidence that will contribute to the formulation of more objective return-to-play guidelines.

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## VALIDITY AND RESPONSIVENESS OF CLINICAL BALANCE MEASURES IN PERSONS WITH TRAUMATIC BRAIN INJURY

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3. **Jeanne M. Lojovich**, PT, NCS, The University of Minnesota, Minneapolis, MN, USA
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### Objectives:

1. To investigate concurrent validity, using functional measures as the gold standard, for clinical balance scales in persons with TBI.
2. To compare the ability of Berg Balance Scale, Tinetti Balance Subscale, Timed Up and Go, and Functional Reach test to detect change over time in persons with traumatic brain injury.

In order to monitor the effect of physical therapy interventions, valid and responsive clinical measures must be available to assess status and progress with regard to balance in persons with brain injuries (TBI). A preliminary sample of convenience of 7 male and 1 female patients (post TBI) of a Veteran's hospital who could follow simple directions and stand for 15 seconds, were evaluated twice within the first 2 to 3 days of attaining inclusion criterion skills using Berg Balance Scale (Berg), Tinetti Balance Subscale (Tinetti), Functional Reach Test (FR), Timed Up and Go Test, walking velocity and Functional Independence Measure. All subjects were reassessed at 14 to 21 days after the initial measurement with additional data obtained at 6 weeks, 3, 6, and 12 months for some subjects. Data for the 8 subjects at initial and 3 week follow up were used in the analysis.

Pearson correlation coefficients between balance and function measures were generally high (.75-.97) except for walking velocity which showed moderate to high correlation (.47-.91) representing a strong relationship between balance and function measures in persons with TBI. Standardized response means (SRM) and effect sizes (ES) for the Berg (SRM=-.684, ES=-.344), Tinetti (SRM=-.90, ES=-.272), Functional Reach (SRM=-.964, ES=-.488), and Timed Up and Go (SRM=-.671, ES=.325) showed the Functional Reach test to be most responsive to change in the 8 subjects with TBI over a 3 week time frame. Increased subject numbers and longer follow-up should indicate which of the balance measures provide the most efficient mechanism for demonstrating treatment effectiveness and change over a longer time frame.

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## SEVERE CEREBRAL HYPOXIA – LONG-TERM CASE SERIES OUTCOMES

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### Objective

Comprehensive assessment and long-term follow-up of patients admitted with severe cerebral hypoxia.

### Method

Standardised neuropsychological assessments were conducted on 6 patients. Seven patients were serially assessed on WHIM, GCS and Rancho Los Amigos scale over 1-2½ years post-insult.

### Interventions

Serial re-assessments were conducted to detect changes in arousal / awareness which informed treatment, rehabilitation planning and community placement.

### Main Outcome Measures

Standardised measures included: WAIS-R, RBMT, Rey AVLT, Test of Everyday Attention, Visual Object & Spatial Perception Battery, Behavioural Assessment of Dysexecutive Syndrome. Among patients in vegetative / minimally responsive states, Wessex Head Injury Matrix, GCS and Rancho Los Amigos Scale were administered.

### Results

Patients in vegetative / minimally responsive states showed subtle and detectable changes on WHIM assessments. GCS and Rancho Los Amigos Scale did not detect change. On standardised measures, patients displayed severe memory problems (5), visual / auditory selective attention & sustained attentional difficulties (4), impaired executive functioning (4), object perceptual or spatial perception deficits (3) and passivity as well as a lack of awareness / insight (4).

### Conclusions

Among patients in vegetative / minimally responsive states, the WHIM is a suitable and sensitive measure, which detects changes over prolonged periods. Such longitudinal assessment of arousal / awareness is warranted in cases of severe cerebral hypoxia. For those who can be assessed on standardised measures, consideration needs to be given to the probable presence of memory, new learning, attention and executive deficits in planning suitable community placements.



## EXECUTIVE FUNCTIONS AND THE ORGANISATION OF EVERYDAY ACTIONS

1. **Andrew D. Worthington**, Consultant Neuropsychologist Brain Injury Rehabilitation Trust & Centre for Behavioural Brain Sciences, University of Birmingham, UK
2. **Esther Castermans**, Research Associate, Centre for Behavioural Brain Sciences, University of Birmingham, UK
3. **Steven Coles**, Assistant Psychologist, Brain Injury Rehabilitation Trust, Birmingham, UK
4. **Glyn W. Humphreys**, Centre for Behavioural Brain Sciences, University of Birmingham, UK

### Objectives:

1. To investigate the real-life impact of severe brain injury on practical tasks of everyday living.
2. To explore the neuropsychological (executive) basis to problems in organising everyday actions.
3. To develop a practically-based screening protocol for use by clinicians in rehabilitation clinics, with clear treatment implications.

The ability to carry out everyday actions in naturalistic settings is crucial to successful recovery after brain injury. Yet only recently have researchers begun to investigate the cognitive processes that underlie everyday behaviour disorders (Schwartz & Buxbaum, 1997; Humphreys & Forde, 1998). In particular, the role of executive processes in routine, as opposed to novel, actions has been neglected.

We developed a screening protocol to explore these issues with patients admitted to our centre for neurobehavioural rehabilitation. Each participant underwent a neuropsychological test battery, and was asked to demonstrate how to perform a series of structured everyday tasks (eg. wrapping a present) under four conditions: participants were asked to (1) describe the steps involved in carrying out the task, to place in temporal order a sequence of (2) pictures and (3) written instructions of the stages involved in the tasks, and (4) to carry out the tasks using real objects. They were also assessed on a version of the Multiple Errands task (Shallice & Burgess, 1991), a loosely structured multi-task exercise carried out in a shopping precinct. Patients were significantly impaired on all tasks, but performance improved with cues, suggesting that brain injury causes an under-activation of action schemas rather than loss of knowledge. Executive tests sensitive to deficiencies in activation of behavioural schemas could predict performance on previously overlearned action tasks.

Other executive processes associated with behavioural regulation are involved in



novel and multi-tasking situations.

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## ANIMAL ASSISTED THERAPY - THE DOORWAY TO HEALING

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### Objectives:

1. Understand how animal assisted therapy can positively affect rehabilitation outcomes in individuals with brain injury.
2. Evaluate the effectiveness if animal assisted therapy in brain injury rehabilitation.
3. Show how animal assisted therapy supports research in left-brain, right-brain integration and intuitive function.

A.P.H.A.R. (Animal Partners In Healing & Recovery) is an Animal Assisted Rehabilitation Therapy Program. This therapeutic model and curriculum originated in Eugene, Oregon in 1990, and is now based in Tucson, Arizona. It is significant that individuals who participate in this program make significant strides in their recovery process. There is ongoing research in intuitive, right-brain therapies connecting animal assisted therapy with positive outcomes in brain injury rehabilitation.

Animals enable us to look at ourselves in a profound way. They can mirror parts of ourselves that are often hidden, thereby increasing self-awareness, self-acceptance, and encouraging intuitive function. Individuals who survive a brain injury struggle to survive a new life and a new Self. Animal assisted therapy creates a non-jungemental therapeutic environment where the individual can re-connect with Self. The relationship that develops between the individual and the therapy animal is often magical, opening the way to in-depth healing.

In A.P.H.A.R., the animal takes on the role of therapist while the therapist facilitates the interaction between animal and client. Grooming a horse or brushing a dog becomes a process where therapeutic goals can be facilitated, and the brain can work of left-brain, right -brain integration. Oftentimes, in these sessions, the client will be encouraged to tell her or his story. In so doing, an energetic healing bond is created between animal and human.

It appears that individuals with brain injury can benefit from animal assisted therapy both early and late in their recovery process, even when progress has reached a plateau.

### References:

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## **PREDICTORS OF RECOVERY AFTER TRAUMATIC BRAIN INJURY: A <sup>1</sup>H-MR SPECTROSCOPY STUDY**

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4. **P. Chiarini**, MD, Neuroradiology Perugia General Hospital, Italy
5. **G. Gobbi, R. Tarducci, O. Presciutti**, Medical Physics, Dept. of Rehabilitation ASL 3 and Neuroradiology Trevi, Perugia, Italy

### **Objectives:**

1. Find a predictor parameter of recovery after traumatic brain injury using spectroscopy.

**Description:** It has been demonstrated that <sup>1</sup>H-MR Spectroscopy (<sup>1</sup>H-MRS) is useful in identifying damage to the Central Nervous System (CNS) after traumatic brain injury (TBI) (Zampolini, Tarducci et al. 1997). In normal appearing white matter (NAWM) a decrease of N-acetyl-aspartate (NAA) as well as an increase of Ins and Choline (Cho) peaks were found (Ross, Ernst et al. 1998), (Garnett, Blamire et al. 2000). The aim of this study was to reveal any correlation between the variation of spectroscopy in the rehabilitative phase which could be a predictor of recovery after TBI.

**Methodology:** Seven patients were studied with <sup>1</sup>H-MRS (time lapse range was 33-108 days from the trauma). The mean age of the patients was 25.5 years (SD 7.1), (range 21-36),

The <sup>1</sup>H-MRS studies were performed with 1.5 Tesla NMR-Imaging system in Mid-Brain NAWM. Imaging preceded spectroscopy to define the volume of interest (VOI) and exclude visible involvement of NAWM.

The study compares the NAA/Cho ratio with functional and outcome parameters such as Level of Cognitive Function (LCF), Glasgow Outcome Scale (GOS) and Disability Rating Scale (DRS) 18 months after the trauma.

The statistical analysis shows that the Spearman correlation between LCS and NAA/Cho ratio was significant (p= 0.02 R=0.8), the GOS (p=0.03) and DRS (p=0.05) were also significant.

**Conclusion:** The main finding of this study is that the decrease of NAA and increase of Cho could be predictors of recovery. These values could provide parameters for the quantification of diffuse axonal injury. A larger study sample is however required to confirm this suggestion.



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## RETROSPECTIVE STUDY OF TRAUMATIC BRAIN INJURY IN ITALIAN REHABILITATION CENTRES

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Objectives :

1. Describe the rehabilitation intervention in traumatic brain injury in Italy.

On behalf of multi-centre study group

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A multi-centre retrospective study of traumatic brain injury (TBI) was organized in order to study the clinical characteristics of patients admitted to rehabilitation centres and the clinical intervention adopted.

The study involved 16 Italian rehabilitation centres, concerning the period from 1<sup>st</sup> January 1995 to 31<sup>st</sup> December 1996. All the patients consecutively admitted and discharged during this period were included in the study.

The sample included 643 patients concerning first (537) or second admission (106) for rehabilitation.

There were 494 males and 149 females, the mean age was 34.31 years (range 4-95). For the first admissions, the median time from the trauma to the admission to a rehabilitation centre was 45.5 days and the median length of stay (LOS) was 58.5 days. The most frequent cause of the TBI was road accident (79.42%). We ranked the



Glasgow Coma Scale (GCS) in the first 24 h after trauma as: severe (GCS < 8) 72.44%, moderate (GCS = 8-11) 11.02%, mild (GCS ≥ 12) 16.54%.

The mean duration of coma was 30 days and there was a strong correlation with severity of GOS upon discharge. On admission 39.49% had been transferred from a neurosurgery ward, 22.66% from an intensive care ward and 11.21% from the accident site. Upon discharge 59.12% of subjects went home while 24.41% carried on the rehabilitation program as outpatients.

The study shows a picture of the pattern of rehabilitative intervention in TBI in Italy. The data provides a useful starting point for the improvement of rehabilitation in TBI.



## SEXUAL DAMAGE AND ENSUING LEGAL ASPECTS

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Here we examine how sexual deficits directly or indirectly due to TBI are evaluated juridically. Existing literature highlights the physiological aspects but not the repercussions that involve the personal sphere of such deficits although both may be of considerable importance for the patient, his/her partner and family (Gosling 1999, David 1990).

A sexual deficit has to be identified with biological damage by a lawyer for it to be evaluated juridically by a judge in terms of damage claim. Thus, preliminary to a court hearing, a court appointed expert must establish the existence of a biological background to the sexual deficit as proposed by the lawyer's documentation. The latter should include witness declarations, psychological profiles and medical forensic reports.

Indirect damage to the partner is usually not considered, although a judge may decide to evaluate it under the heading of existential damage.

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