Lex Frieden

Research Projects Guide

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Introduction

The synopses compiled herein describe research being conducted at or on behalf of TIRR. Submissions were elicited in January, 1993 for this bi-annual revision of the guide. It is hoped that this document will provide useful for:

alerting colleagues to possibilities for research collaboration,

orienting students, residents, and fellows to research activities in which they may wish to participate,

informing rehabilitation professionals about opportunities for consultation or technical assistance in specific problem areas, and

fostering a sense of the overall nature and scope of TIRR research.

The goal of TIRR research is achieving new knowledge needed to improve the effectiveness of services for disabled persons. Through research we strive to:

understand the causes and consequences of chronic physical impairment, disability, and handicap;

develop improved treatment procedures and assistive equipment for minimizing impairment, disability and handicap; and

develop and evaluate service innovations that promote the independence of persons with severe physical disability and that are responsive to the need for cost containment.

Table of Contents

Services to People with Traumatic Brain Injuries in Community-Based Living Centers
Laurel Richards; Deborah Wilkerson; Margaret A. Nosek, Ph.D.; Laurie Gerken

Wives Who Choose to Stay Married After Their Husbands' Traumatic Brain Injuries
Catherine Foley, Ph.D.; L. Don Lehmkuhl, Ph.D.; Margaret A. Nosek, Ph.D.; Mary Ellen Young, Ph.D.; Diana H. Rintala, Ph.D.

3. Cardiovascular Function

Bioimpedance Spectroscopy of Paralyzed Muscle
David Cardus, M.D.; Francisca Ribas-Cardus, Wesley G. McTaggart

Cardiorespiratory Function in Spinal Cord Injury, Follow-Up and Aging Effects
David Cardus, M.D.; Wesley G. McTaggart; Francisca Ribas-Cardus

G+100% Gradient Centrifugation During Sleep and Exercise: Its Utility in Counteracting Physiological Microgravity Effects
David Cardus, M.D.; Wesley G. McTaggart; Francisca Ribas-Cardus

Physical Exercise and Ischemic Heart Disease
David Cardus, M.D.; Wesley McTaggart; Francisca Ribas-Cardus

4. Independent Living

Assessing Knowledge of the Americans with Disabilities Act
Earl Walden, D.Ed.; Quentin Smith, M.S.; Margaret A. Nosek, Ph.D.

Collaboration Between Model Spinal Cord Injury Systems and Independent Living Centers in Facilitating Independent Living by Persons with Recently Incurred Spinal Cord Injury
Margaret A. Nosek, Ph.D.

Evolution of Independent Living Programs: A Longitudinal Study
Margaret A. Nosek, Ph.D.; Carol Howland; Laurel Richards, Laurie Gerken

ILRU Research and Training Center on Independent Living at TIRR
Lex Frieden; Margaret A. Nosek, Ph.D.; Laurie Gerken; Laurel Richards

Improving Service Systems for People with Disabilities
Lex Frieden; Laura S. Smith, Ph.D., Kym King

Involvement of Independent Living Centers in ADA Service Delivery
Margaret A. Nosek, Ph.D.; Carol Howland

Leadership Development in the Independent Living Movement
Laurel Richards; Laurie Gerken; Quentin Smith; Three Rivers Independent Living Center; Judy Barricella

Personal Assistance: Its Effect on the Long-Term Health of a Rehabilitation Hospital Population
Margaret A. Nosek, Ph.D.

Profiles of Independent Living Centers that Provide Services to Rural Areas
Margaret A. Nosek, Ph.D.; Carol A. Howland; Earl Walden, D.Ed.

5. Orthotics and Prosthetics

Artificial Finger Joint
Thomas A. Krouskop, Ph.D.

The Next Generation of Myoelectric Prosthesis
William H. Donovan, M.D.; Diane J. Atkins, OTR

6. Rehabilitation Engineering

A Disposable Pressure Reducing Pad for the Operating Room
Thomas A. Krouskop, Ph.D.

An Ultrasonic Technique to Noninvasively Measure the Stiffness of Soft Tissue-Assessment of Ulcerated Tissue
Thomas A. Krouskop, Ph.D.

7. Rehabilitation Research Training

Rehabilitation Research Career Development Fellowship Program
Thomas A. Krouskop, Ph.D.

8. Sexuality

Sexuality Issues Among Women with Physical Disabilities
Margaret A. Nosek, Ph.D.; Diana H. Rintala, Ph.D.; Carol Howland

9. Skin

Analysis of Reported Pressure Sore Management in Persons with Spinal Cord Injury
Susan L. Garber, M.A., OTR;

An Analytical Service Demonstration of the Role of Biochemical and Behavioral Indicators in the Prevention of Recurrent Pressure Sores
Gladys P. Rodriguez, Ph.D.; Susan L. Garber, M.A.

Enhancing Self-Management Techniques for Preventing the Occurrence or Progression of Pressure Sores
Susan L. Garber, M.A., OTR; Karen A. Hart, Ph.D.

A Randomized Double-Blind Controlled Trial of Platelet Derived Growth Factor (PDGF) in the Management of Pressure Ulcers
Saleh Shenaq, M.D.; Susan L. Garber, M.A., OTR; Beth O'Neill, R.N.

10. Spinal Cord Injury

Aging in Relation to Spinal Cord Injury
Diana H. Rintala, Ph.D.; David Cardus, M.D.; Karen A. Hart, Ph.D.; Rebecca Clearman, M.D.

Clinical Manifestation of Sub-Clinical Brain Influence in Clinically Complete Spinal Cord Injury
Jonathan R. Strayer, M.D.; Milan R. Dimitrijevic, M.D.; A. Arthur Sherwood, Ph.D.; Barry McKay; Stephen M. Tuel, M.D.

Comparative Longitudinal Study of Rehabilitation Outcomes for Women and Men with Spinal Cord Injury
Diana H. Rintala, Ph.D.

Factors Influencing the Risk of Spinal Cord Injury
R. Edward Carter, M.D.; Dan Graves, B.S.; Teresa Giles

Health Services Utilization by Persons with SCI
Era Buck, Ph.D.; Diana H. Rintala, Ph.D.; Karen A. Hart, Ph.D.; Rebecca Clearman, M.D.

The Influence of Caregiver Well-Being on Outcomes for Persons with Spinal Cord
Diana H. Rintala, Ph.D.; Jann E. Dodd, M.A.; Mary Ellen Young, Ph.D.

Interventional Pain and Spasticity Management
William H. Donovan, M.D.; Raj K. Narayan, M.D.

Life Status Study of Persons with Spinal Cord Injury
Diana H. Rintala, Ph.D.; Karen A. Hart, Ph.D.; Rebecca Clearman, M.D.; David Cardus, M.D.

Long-Term Follow-Up of Equipment Utilization by Persons with Spinal Cord Injury
L. Don Lehmkuhl, Ph.D.

Rehabilitation Research and Training Center in Community-Oriented Services to Persons with Spinal Cord Injury
R.E. Carter, M.D.; Diana H. Rintala, Ph.D.; Karen A. Hart, Ph.D.

Texas Regional Spinal Cord Injury System
William H. Donovan, M.D.; R. Edward Carter, M.D.

The Use of Plasmid DNA Analysis to Determine the Source of Bacterial Invasion of the Urinary Tract
William H. Donovan, M.D.; Richard Hull, Ph.D.

Variations in Readiness for Alternative Vocational Rehabilitation Services Among Persons with Spinal Cord Injury
Mary Ellen Young, Ph.D.; Wayne G. Alfred, M.A.

Ventilatory Dependent Spinal Cord Injury Registry
R. Edward Carter, M.D.; Dan Graves, B.S.; Francine Mechoulam

1. Amputation

Ongoing TIRR Research

Descriptive Title of the Activity: Epidemiologic Overview and Analysis of 1100 Amputees

Investigator(s)--Name and office telephone number:
Diane J. Atkins, OTR 713-797-5239
William H. Donovan, M.D. 713-797-5912

Descriptors: Amputations and Amputees, Epidemiology

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

From 1979-1991 approximately 1100 upper and lower extremity amputees have been evaluated and treated at TIRR. The uniqueness of this population is well demonstrated in its mix of etiologies, large number of upper extremity amputees work related incidents and significant functional outcomes as most of the individuals are able to return to work or school. The retrospective analysis will be carried out through a review of medical record charts and departmental records. Statistics of age at onset, sex, race, type of amputation, etiology, time from amputation to rehabilitation, prosthetic treatment, funding sources and functional outcomes will be reviewed.

Ongoing TIRR Research

Descriptive Title of the Activity: Overview of the TIRR Experience with Electrical Burn Amputees

Investigator(s)--Name and office telephone number:
Diane J. Atkins, OTR 713-797-5239
William H. Donovan, M.D. 713-797-5912

Descriptors: Amputations and Amputees; Epidemiology; Burn Injuries

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

The Institute for Rehabilitation and Research (TIRR) has had extensive experience with the burn patient who has lost one or more limbs in an electrical, thermal, or flash burn. From the inception of our amputee program 11 years ago, 83 electrical burn patients have received comprehensive prosthetic rehabilitation. Many issues include cause of injury, duration of rehabilitation, amputee levels and prosthetic prescriptions, level of functional independence, and a review of their ability to return to work or school.

2. Brain Dysfunction

Ongoing TIRR Research

Descriptive Title of the Activity: Correction of Limitations in Joint Range of Motion in Patients with Severe Brain Injury

Investigator(s)--Name and office telephone number:

L. Don Lehmkuhl, Ph.D.	713-666-9550
Linda Thoi, MPH	713-666-9550
Charlene Baize, OTR	713-797-5954
Lucy Krawczyk, MS, PT	713-797-5297

Descriptors: Serial/Inhibitive Casting; Contractures; Range of Motion

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

The development of contractures in patients who survive severe brain injuries is a common and serious problem. This study is designed to document the initial and long-term changes in joint range of motion in the elbows, knees, and ankles of persons with severe traumatic brain injury who are treated with serial/inhibitive casts.

See the Journal of Head Trauma Rehabilitation 1990;5(4):23-43 for a report of preliminary findings.

Ongoing TIRR Research

Descriptive Title of the Activity: Correlation Between Selected Measures of Neuropsychological Abilities in Persons with Traumatic Brain Injury

Investigator(s)--Name and office telephone number:

Walter High, Ph.D.	713-666-7323
Linda Thoi, MPH	713-666-9550
Carol Jung, M.S.	713-666-7323
L. Don Lehmkuhl, Ph.D.	713-666-7323

Descriptors: Functional Assessment, Neuropsychological Assessment, Brain Injury

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

Patients receiving comprehensive rehabilitation in the TIRR Brain Injury Rehabilitation Program undergo several types of assessments. The purpose of this study is to examine the degree of correlation between items on different assessment tools which are believed to tap into similar neuropsychological functions of the brain.

Ongoing TIRR Research

Descriptive Title of the Activity: Driving Safety After Traumatic Brain Injury

Investigator(s)--Name and office telephone number:

Corwin Boake, Ph.D.	713-797-5913
Chad Stromatt	713-797-5947
L. Don Lehmkuhl, Ph.D.	713-666-9550

Descriptors:

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

This study is a collaboration between staff of the TIRR Occupational Therapy Department, Neuropsychology Department, and Traumatic Brain Injury (TBI) Model System project. The goal of the study is to determine the risks associated with resuming driving after severe TBI. The study is examining the driving safety records of persons with severe TBI who have successfully completed drivers evaluation at TIRR and who have re-earned their drivers licenses from the Texas Department of Public Safety. The study is attempting to identify the types of driving safety problems which occur after TBI and which clinical and demographic features are predictive of driving safety in this population. The results should help improve driver's training for persons with TBI.

Ongoing TIRR Research

Descriptive Title of the Activity: Minimizing Disability After Brain Injury

Investigator(s)--Name and office telephone number:

L. Don Lehmkuhl, Ph.D.	713-666-7323
Stuart Yablon, M.D.	713-797-5733
Cindy Ivanhoe, M.D.	713-797-5730

Descriptors: Brain Injury Rehabilitation; Costs of Care; Functional Assessment

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

1. Identify and evaluate factors that produce optimal recovery from brain injury, identify factors that result in less than optimal recovery, and institute programs for promulgating optimal techniques for the management of brain injury.

2. Document the short- and long-term costs of injuries, and their rehabilitation;

3. Plan and implement an injury surveillance system for gathering and integrating information from a variety of sources on which to base planning and evaluation of efforts to control brain injury.

Ongoing TIRR Research

Descriptive Title of the Activity: Patterns of Recovery of Physical and Cognitive Abilities Following Traumatic Brain Injury

Investigator(s)--Name and office telephone number:

L. Don Lehmkuhl, Ph.D.	713-666-7323
Linda Thoi, MPH	713-666-9550
Don Rossi, M.S.	713-797-5973

Descriptors: Brain Injury; Functional Assessment

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

This research is designed to examine the patterns of functional recovery (both motor and cognitive) of patients admitted to the TIRR Brain Injury Rehabilitation Program following traumatic brain injury. Functional abilities are documented by members of the Brain Injury Treatment Team utilizing the Functional Assessment Measure (FAM). The results will serve as the basis for revising the FAM to shorten and simplify it.

Ongoing TIRR Research

Descriptive Title of the Activity: Prediction of Seizure Risk in Persons with Traumatic Brain Injury

Investigator(s)--Name and office telephone number:
Stuart Yablon, M.D. 713-797-5733
Linda Thoi, MPH 713-666-9550

Descriptors: Seizure; Brain Injury; Epilepsy

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

Following a traumatic brain injury, the patient is at risk for developing seizures. The purpose of this study is to test the accuracy of a mathematical model for predicting the probability of developing seizures. The model includes several weighted indicators based on the presence or absence of physical signs. The numerical result is an estimate of the probability for developing seizures and is used to determine if anticonvulsant medication should be used prophylactically.

Ongoing TIRR Research

Descriptive Title of the Activity: Prevention of Traumatic Brain Injury and Spinal Cord Injury

Investigator(s)--Name and office telephone number:

Terri Hudler-Hall	713-797-5971
Maritza Cabera, M.A.	713-666-4550
L. Don Lehmkuhl, Ph.D.	713-666-7323

Descriptors: Injury Prevention, School Program TBI, SCI

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

Injury accounts for more years of life list than cancer and cardiovascular disease put together. Injury to the central nervous system can result in severe disability. TIRR has initiated an injury prevention program that conforms with the guidelines published by the American Association of Neurological Surgeons and the congress of Neurological Surgeons. The program is presented to junior and senior high school students in the greater Houston area. Faculty includes TIRR staff members, survivors of CNS trauma, and radio, TV and sports personalities. The message is "Think First" before placing yourself in situations with unduly high risk of injury to the CNS.

Ongoing TIRR Research

Descriptive Title of the Activity: Relationship Between Body Scheme and Function in Traumatic Brain Injury

Investigator(s)--Name and office telephone number:
Judy Bachelder, Ph.D., OTR
Ann St. John, OTR 713-797-5954
Susan Garber, M.S., OTR 713-797-5954

Descriptors:

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

The purpose of this project is to explore the potential relationship between body scheme and functional skills of individuals with traumatic brain injury (TBI). Aspects of body scheme to be examined include somatognosia, right/left discrimination and unilateral neglect. Functional skills to be measured include dressing, feeding, grooming and hygiene. In order to determine the significance of body scheme performance as a predictor of functional ability, scores from a perceptual battery administered to each subject are analyzed in a multiple regression equation with body scheme and functional skills. Other variables which will be analyzed include age, duration of injury and locus of brain injury. This project involves 50 TBI patients ranging in age from 16 to 50. This research is expected to contribute to the ability of occupational therapists to evaluate and develop treatment for body scheme disorders in patients with traumatic brain injury.

Ongoing TIRR Research

Descriptive Title of the Activity: Reliability of Videofluroscopic Evaluation of Aspiration

Investigator(s)--Name and office telephone number:
Matthew Reith, M.D.
Marc Strickler, M.D.
Jean Herzog, Ph.D. 713-799-5002

Descriptors:

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

The objective of this project are to measure interobserver and intraobserver reliability of experienced radiologists and speech pathologists when reading retrospectively selected Modified Barium Swallow videofluoroscopic studies of neurologically impaired adults for the presence and percentage of aspiration. Data collection is in progress.

Ongoing TIRR Research

Descriptive Title of the Activity: Services to People with Traumatic Brain Injuries in Community-Based Independent Living Centers

Investigator(s)--Name and office telephone number:
Laurel Richards 713-520-0232
Deborah Wilkerson, Consultant, National Rehabilitation Hospital
Margaret A. Nosek, Ph.D. 713-520-0232
Laurie Gerken 713-520-0232

Descriptors: Independent Living, Brain Injuries (Traumatic)

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

Persons with traumatic brain injury have a variety of service needs that potentially can be met by independent living centers (ILCs). However, some of these persons, especially those with severe cognitive impairments, have service requirements different from those posed by other consumers. This project is concerned with documenting the kinds and extent of ILC services that are being provided persons with traumatic brain injury. A survey was sent to all ILCs to identify those which are serving this population. It was followed up by in-depth telephone interviews with those centers indicating considerable experience in serving these individuals. The survey dealt with types of services provided, problems which exist in serving this population, and the extent to which ILCs have incorporated people with traumatic brain injuries into their consumer directed structures, boards, staff, and peer groups.

Results of this study are forming the basis for a monograph being written for the ILRU Issues in Independent Living technical report series.

Ongoing TIRR Research

Descriptive Title of the Activity: Wives Who Choose to Stay Married After Their Husbands' Traumatic Brain Injuries

Investigator(s)--Name and office telephone number:

Catherine C. Foley, Ph.D.	713-666-9550
L. Don Lehmkuhl, Ph.D.	713-666-9550
Margaret A. Nosek, Ph.D.	713-520-0232
Mary Ellen Young, Ph.D.	713-666-9550
Diana H. Rintala, Ph.D.	713-960-1233

Descriptors: Wives, Traumatic Brain Injury, Qualitative Research

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

This research is designed to examine and use qualitative data collection with wives who have chosen to remain married to spouses who have sustained a traumatic brain injury (TBI). Results will serve as the basis for: a) quantitative data gathering, b) future qualitative data gathering, and c) proposed provision of services by professionals who attempt to meet the immediate and long-term needs of wives whose husbands have suffered traumatic brain injuries.

Initial research questions include:

1. Are there patterns of thoughts, behaviors, feelings within the individual as "wife" that predict marriage stability after a traumatic brain injury?

2. Are there previous life experiences for the wife that more likely predict marriage stability after the husband's TBI?

3. Are there particular times from the initial trauma data, when a wife wants and/or is more likely to access particular types of formal and informal services for her own well-being?

3. Cardiovascular Function

Ongoing TIRR Research

Descriptive Title of the Activity: Bioimpedance Spectroscopy of Paralyzed Muscle

Investigator(s)--Name and office telephone number:

David Cardus, M.D.	713-798-5666
Francisca Ribas-Cardus	713-798-5662
Wesley G. McTaggart	713-798-5664

Descriptors: Electric Impedance, Spectroscopy, Paraplegia

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

Spinal cord injury causes a disruption of the communication between the central nervous system and the effector organs, in particular, the skeletal muscle system. As a consequence the skeletal muscle is subject to physiological and structural changes.

Recent technological developments have made possible the application of electrical impedance measurements for studies of tissue structural changes. Instrumentation for bioimpedance spectroscopy is now available.

The rationale of bioimpedance measurements for studies on the human being is based on in vitro tissue studies done over the last sixty years. This validates the biological interpretation of non-invasive bioimpedance measurements on the human being.

The purpose of this project is to conduct bioimpedance spectroscopic measurements on patients with paraplegia to compare structural parameters of an analog circuit model of muscles of the leg (paralyzed) and muscles of the arm (normal). If significant differences can be established, then one of the clinical applications of bioimpedance spectroscopy could be the assessment of the extension of the muscle structural changes and/or the evaluation of rehabilitative procedures of muscle function.

Ongoing TIRR Research

Descriptive Title of the Activity: Cardiorespiratory Function in Spinal Cord Injury, Follow-Up and Aging Effects

Investigator(s)--Name and office telephone number:

David Cardus, M.D.	713-798-5666
Wesley G. McTaggart	713-798-5664
Francisca Ribas-Cardus	713-798-5662

Descriptors: Spinal Cord Injury, Aging

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

This project focuses upon the identification of changes in cardiovascular and pulmonary function in the non-hospitalized spinal cord injured patient to relate them to clinical and physiological problems and to aging. The objectives are: 1) a longitudinal analysis of risk factors for coronary heart disease (CHD) and cardiovascular deterioration, 2) a longitudinal analysis of risk factors for deep venous thrombosis (DVT); and 3) a longitudinal assessment of pulmonary function variables to determine whether they can be considered as possible risk factors of pulmonary morbidity.

Three levels of testing are planned. The first level will be collection of basic historical data (clinical and socioeconomic), biochemical, cardiovascular and pulmonary data. The second level of testing will consist of two provocative procedures--arm ergometry for patients who can do exercise with the arms and the passive tilt for those who cannot. A third will be recommended in some cases and consist of special diagnosis of evaluative procedures which require special equipment or expertise we do not possess.

The phase of initial data collection has been completed. A preliminary analysis of the data collected has been reported in the Progress Report-1990 for the Rehabilitation Research and Training Center in Community Oriented Services for Persons with Spinal Cord Injury, pp. 43-54.

The following papers were published:

Cardus D, Cardus FR, and McTaggart WG. Coronary risk in spinal cord injury: Its assessment following a multivariate approach. Archives of Physical Medicine and Rehabilitation 1992;73:930-933.

Cardus D, Ribas-Cardus, F, and McTaggart WG. Lipid profiles in spinal cord injury. Paraplegia 1992;30:775-782.

Ongoing TIRR Research

Descriptive Title of the Activity: G+100% Gradient Centrifugation During Sleep and Exercise: Its Utility in Counteracting Physiological Microgravity Effects

Investigator(s)--Name and office telephone number:

David Cardus, M.D.	713-798-5666
Wesley G. McTaggart	713-798-5664
Francisca Ribas-Cardus	713-798-5662

Descriptors: Microgravity simulation

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

This is a NASA project. Its principal objective is to find out if artificial gravity could be used as a countermeasure of the cardiovascular deconditioning that occurs in prolonged space flights. A short arm centrifuge for human use has been designed and built to product artificial gravity. Currently, tests are being conducted to assess the physiological response to various g-levels (acceleration forces) and durations (time of exposure to acceleration). Sleep studies will also be conducted to study the quality of sleep while subjects sleep in the centrifuge.

It is speculated that the results of this research may support some medical applications.

The following papers have been published:

Cardus D, Diamandis P, McTaggart WS, and Campbell S. Development of an artificial gravity sleeper (AGS). Physiologist 1990;33:S112-S113.

Cardus D, McTaggart WS, and Campbell S. Progress in the development of an artificial gravity simulator. The Physiologist 1991;34:S224-S-225.

McTaggart WG and Cardus D. Data acquisition system for the Artificial Gravity Stimulator (AGS). The Physiologist 1992; 35:S119-S121.

The following papers have been submitted for publication:

Cardus D, McTaggart WG. Observations on the cardiovascular response to the AGS. IDEEA I. University of Houston, 1991.

Cardus D, McTaggart WG. The cardiovascular response to the AGS. The Physiologist, 1992.

Cardus D, McTaggart WG. Artificial gravity as a countermeasure of physiological deconditioning in space. COSPAR, 1992.

Ongoing TIRR Research

Descriptive Title of the Activity: Physical Exercise and Ischemic Heart Disease

Investigator(s)--Name and office telephone number:

David Cardus, M.D.	713-798-5666
Wesley G. McTaggart	713-798-5664
Francisca Ribas-Cardus	713-798-5662

Descriptors: Stress Testing, Work Tolerance, Cardiac Rehabilitation

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

The objectives are: 1) to determine work tolerance of cardiac patients having ischemic heart disease (IDH), and 2) assessment of the value of physical exercise as a rehabilitative or preventive procedure for ischemic heart disease. Cardiorespiratory responses during the performance of physical work, exercise on a bicycle ergometer, are measured by continuous external recording of heart rate, ECG and blood pressure. A discontinuous protocol consisting of 5 minutes exercise at measured work loads with 5 minutes rest in between. Work loads are increased until exhaustion or until the heart rate reaches 90-95% of predicted age adjusted maximum. Samples of expired gases are collected during the last minute of exercise in Douglas bags and analyzed for 0_2 and CO_2 concentrations with a mass spectrometer. VO_2 max is calculated by extrapolation using regression analysis. Prior to the exercise stress test other physiological variables such as ECG, blood pressure, heart rate, apexcardiogram, carotidogram, and chest electrical impedance (Kubicek method) for cardiac cycle time intervals, stroke volume and cardiac output are recorded by surface electrodes. A blood sample is drawn for biochemical analysis of blood lipids, cholesterol, HD cholesterol, triglycerides and other blood parameters. Cardiovascular rehabilitation of the cardiac patient follows a prescription of exercise and is performed on the bicycle ergometer with continuous monitoring of the ECG on an oscilloscope. This work has resulted in the publication of a number of papers and of a book by David Cardus, M.D. The program has demonstrated that the patient with CHD as well as the healthy person in poor physical condition can benefit from a well supervised medically prescribed program of physical exercise.

4. Independent Living

Ongoing TIRR Research

Descriptive Title of the Activity: Assessing Knowledge of the Americans with Disabilities Act

Investigator(s)--Name and office telephone number:

Earl Waden, D.Ed.	713-520-0232
Quentin Smith, M.S.	713-520-0232
Margaret A. Nosek, Ph.D.	713-520-0232

Descriptors:

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

An ADA Scale Pre-Test consisting of 50 multiple choice, true and false, and matching items was constructed to compare independent living center staff (N=124) knowledge of the Americans with Disabilities Act to that of 89 controls. Item analysis was conducted using factor analysis to assess scale and item dimensionality, IRT modeling to determine item discrimination and difficulty and scale reliability. Groups were then compared using the independent sample t-test on three methods of scoring the primary scale dimension.

Dimensionality analyses indicated one prominent dimension, with no indication that response format contributed to the dimensionality of the data. A subset of 17 items did not load on the primary dimension and will thus be excluded from the post-test. The final recommended scale consists of 33 items from all response formats. Since these items contain a preponderance of low to middle ability items, thus providing poor measurement for subjects high in knowledge of the ADA, 7 difficult items will be added to the post-test. This test will be administered to the ILC subjects after training intervention.

Ongoing TIRR Research

Descriptive Title of the Activity: Collaboration Between Model Spinal Cord Injury Systems and Independent Living Centers in Facilitating Independent Living by Persons with Recently Incurred Spinal Cord Injury

Investigator(s)--Name and office telephone number:
Margaret A. Nosek, Ph.D. 713-520-0232

Descriptors: Spinal Cord Injury; Independent Living

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

Under auspices of the Texas Model Spinal Cord Injury System, a project is being conducted to develop, implement, and systematically evaluate a cooperative, model reentry program involving a medical rehabilitation program and an independent living center. Building on the experience of the University of Michigan spinal cord injury system, this project will assess the expectation that by providing coordinated community living reentry services by a medical rehabilitation program and an independent living center during the post-discharge period, life-adjustment will be enhanced during that period and, in turn, long-term adjustment will be enhanced as well. Life-adjustment is being evaluated in terms of the individual's physical and subjective well-being, psychological and functional independence, productivity, social integration, and intensity of health services utilization, both planned and unplanned.

A cycled treatment and comparison group design is being used. Specifically, for one-four month period, all eligible spinal cord injury inpatients will participate in the model reentry program. For the succeeding four-month period, all eligible patients will receive conventional reentry services. Over the two-year period during which patients are enrolled in the study, 50 patients will be enrolled in the model reentry program and 50 patients will be enrolled in the conventional program. The experience of participants in both programs will be tracked over a two-year period following discharge from the spinal cord injury center. Data acquisition began in January, 1991. Due to the inability to recruit enough subjects, the methodology of this study is currently undergoing revision.

Ongoing TIRR Research

Descriptive Title of the Activity: The Evolution of Independent Living Programs: A Longitudinal Study

Investigator(s)--Name and office telephone number:

Margaret A. Nosek, Ph.D.	713-520-0232
Carol Howland	713-520-0232
Laurel Richards	713-520-0232
Laurie Gerken	713-420-0232

Descriptors: Independent Living, Funding

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

The purpose of this project is to maintain a database on the status of independent living programs nationally, and to identify trends in the development of independent living programs, the emergence of issues encountered in the delivery of independent living services, and changes in the characteristics of consumers of these services.

Profiles of each program responding to a full-length survey have been published in the ILRU Registry of ILPs. In late 1988, a revised and updated survey instrument was mailed to over 400 programs listed in the ILRU Directory of Independent Living Programs. Information was solicited concerning populations served, services provided, characteristics of persons providing services, methods by which services are provided and programs administered, sources of funding, and relationships between programs and their communities. Responses from 189 programs were received and analyzed. A manuscript describing the evolution of independent living programs in the United States and comparing 1988 with 1986 results, as well as one comparing the effects of compliance with federal standards in 1984, 1986, and 1988 on diversity and amount of funding, has been published in Rehabilitation Counseling, 1992, vol. 35.

The 1992 survey of independent living centers was divided into two parts: a shorter written questionnaire and a follow-up telephone survey that focused on budget and ADA technical assistance. Of the 466 questionnaires mailed, 257 were returned, an improved response rate compared to previous years. Although most of the results were similar to those in 1988, average total number of paid staff, particularly those with disabilities, increased. Mean funding amounts for various budget categories also changed significantly, with more centers receiving other direct federal funds, private contributions and dues, fees for service, and other business activities in 1992. Mean dollar amounts of other direct federal funds, state funds, and city and county government funds increased in 1992, while amounts of Federal Title VII Part A funds and private contributions decreased. Of those centers that charge fees for service, only 28.5% charge consumers and 62.5% charge other organizations, 62.7% actively market their services to the community, and 68% are developing consultant services for the ADA. 90.4% of centers provide services to consumers with a variety of disabilities, while 9.6% serve a single disability group, such as blindness. Nearly all respondents provide the five core independent living services of peer counseling, independent living skills training, information and referral, individual advocacy, and community advocacy.

Ongoing TIRR Research

Descriptive Title of the Activity: ILRU Research and Training Center on Independent Living at TIRR

Investigator(s)--Name and office telephone number:

Lex Frieden	713-797-5283
Margaret A. Nosek, Ph.D.	713-520-0232
Laurie Gerken	713-520-0232
Laurel Richards	713-520-0232

Descriptors: Independent Living

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

Supported by the National Institute on Disability and Rehabilitation Research for the period 1990-95, the primary goal of the center is to enhance management performance in independent living centers through improved management practices that are developed and tested in research-based models and disseminated through training and technical assistance programs relying heavily on materials development activities. Network facilitation is a major emphasis of the Center, and in this regard, directories are being maintained on independent living resource materials; technical assistance consultants in specialty areas such as rural service delivery, services to Hispanic populations and persons with traumatic head injury; centers with assistive technology programs; and independent living centers nationwide. The center is guided by the independent living philosophy, particularly with regard to substantial involvement of people with disabilities at all levels of Center operations--as staff members, in advisory roles, and as center consultants.

Current projects include: Demonstrating a method for recruiting qualified independent living center staff; developing and publishing a series of monographs on independent living center management issues; conducting a longitudinal study on the parameters of independent living centers; developing and publishing annotated readings in management literature for independent living center managers; conducting a demonstrating of the role that independent living centers can play in facilitating transition of people with disabilities from medical rehabilitation facilities to community living; demonstrating a model approach to independent living center-based assistive technology services; examining how independent living centers can increase their abilities to serve people who are Hispanic; and implementing comprehensive research utilization and dissemination activities, including directors, newsletter, technical reports, brochures, and other media.

Ongoing TIRR Research

Descriptive Title of the Activity: Improving Service Systems for People with Disabilities

Investigator(s)--Name and office telephone number:

Lex Frieden	713-797-5283
Laura S. Smith	713-520-0232
Kym King	713-520-0232

Descriptors: Independent Living Services; Community-Based Services; Innovations in Disability-Related Service Delivery

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

The overall goal of this program is to provide direction and technical assistance to twelve project sites to strengthen their capacities as community-based agencies, run by and for people with disabilities. The program office at ILRU will work with these project sites to achieve the following objectives: create comprehensive systems of services for people with disabilities; accelerate current efforts by community-based agencies in enhancing the independent functioning of people with disabilities; and foster community-based agencies to become less dependent upon episodic public and charitable funding.

Ten of the original twelve project sites moved from their one year planning phase to a three year implementation phase in February of 1992. The remaining two sites continued planning activities for an additional year and their implementation funding is now under consideration. Program staff continue to work with the individual project sites by meeting the ongoing technical assistance needs, in documenting progress made toward goals identified for each community, and in making further refinements in each site's activities to better meet the needs of people with disabilities in those communities.

In addition, during this past project year a communications component was added to the program. A staff person was hired to provide specific technical assistance to project sites regarding public relations and marketing activities. In addition, the program as a whole is now more involved in public relations activities as they pertain to persons with disabilities and in particular the issue of health care reform.

Although this is principally a service demonstration, it has research components that bear mentioning. The project sites have been encouraged to identify service delivery programs in their communities, design strategies for overcoming those problems, and document effectiveness of these strategies in effectively reducing barriers to effective service delivery. In addition, they have begun revenue generating activities which have far reaching replication for community based agencies run by and for persons with disabilities. ILRU program staff will continue information gathering activities carried out in each of the project communities with the goal of fostering replication of service strategies that appear to be effective. Efforts in this regard will be characterized and reported, along with any outcome data that is collected at the project sites or at other sites where innovative service delivery strategies are replicated and evaluated.

Ongoing TIRR Research

Descriptive Title of the Activity: Involvement of Independent Living Centers in ADA Service Delivery

Investigator(s)--Name and office telephone number:
Margaret Nosek, Ph.D. 713-520-0232
Carol Howland 713-520-0232

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

Using the database of independent living centers that responded to the 1992 written survey, ILRU conducted open-ended follow-up telephone interviews with executive directors about funding sources and ADA service delivery. Of the 182 centers responding, 85.7% offer ADA technical assistance services to the community, center staff have received ADA-related raining in 88.6%, and 48% are developing their own ADA educational materials. The majority (88.4%) of centers provide ADA services to consumers with disabilities, nearly 18.5% to government agencies. A mean of 36.6% of ADA service clients are consumers. About half of centers charge for ADA services, and a typical cost is $50 per hour.

Also in 1992, ILRU conducted an open-ended paper-and-pencil survey of independent living center involvement in ADA service delivery; 22 centers responded. According to the results, the executive director is the staff member who is most likely to answer ADA-related inquiries. Also qualified to field ADA calls in some centers, are ADA project directors, independent living specialists, community education specialists, information and referral specialists, and assistant or associate directors. The board experience of ILCs in responding to requests for ADA Titles I-IV of the ADA and the frequency of inquiries received from the community on a variety of ADA-related topics. Centers receive the most frequent telephone inquiries about access to public accommodations, evaluation of structural barriers, implementation dates of different sections of the ADA, and how to define reasonable accommodation. The segment of the population who makes the most ADA-related inquiries per month is consumers (M-7.30), followed by rehabilitation professionals (M=4.40), government entities (M=4.35), community or social service organizations (M=2.80), and building owners or managers (M=2.40). Other calls come from employers or commercial facilities that are not public accommodations, recreational and entertainment facilities, educational facilities, transportation entities, medical facilities, and churches. The vast majority of ILCs (86.36%) claim that the number of ADA-related inquiries received per month is increasing.

The majority of center-sponsored ADA-related workshops have been for center staff (27%) consumers (23%), and small businesses (19%). Other workshop recipients have included Chambers of Commerce; hospital social workers; representatives of the local deaf community; personnel directors; building design professionals; cite, state, and county government representatives; and public and private schools.

Staff of ILCs obtain information on the ADA training programs, headlines, and written or videotaped materials from such organizations as the Department of Justice, the Department of Transportation, the Equal Employment Opportunity Commission, the Architectural and Transportational Barriers Compliance Board, the Disability Rights Education and Defense Fund, the President's Committee on Employment of People with Disabilities and the U.S. Chamber of Commerce.

Results of these two studies are presented in an article entitled, "Independent Living Centers and Private Sector Rehabilitationists: A Dynamic Partnership for Implementing the ADA," which has been accepted by the NARPPS.

Ongoing TIRR Research

Descriptive Title of the Activity: Leadership Development in the Independent Living Movement

Investigator(s)--Name and office telephone number:
Laurel Richards 713-520-0232
Laurie Gerken 713-520-0232
Quentin Smith 713-520-0232
Three Rivers Independent Living Center, Pittsburg
Judy Barricella, ILRU Training Consultant

Descriptors: Independent Living, Consumerism

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

Research Questions

- Do board members and staff of independent living centers under the level of executive director have a clear understanding of the independent living philosophy?
- Are they able to translate the philosophy into services which facilitate abilities of people with severe disabilities to live independently?
- Have effective approaches to identifying and preparing consumers to take on responsible board and staff positions in independent living centers been developed and, if yes, can these be replicated?
- Are there methods which can be used to involve consumers with leadership potential in activities of organizations with national, regional, and state emphases?

Approach

To conduct this study, a survey questionnaire was sent to approximately 30 executive directors of independent living centers to identify individuals who have high interest in the subject and who have attempted to address the problem. Approximately ten center directors were selected to participate in the in-depth telephone interviews. During these interviews, attention was given to describing the causes of the problem as well as to ways to solve the problem for individual centers and for the measurement on a larger scale. Preliminary results of the study were given at a presentation at the annual conference on independent living. A publication is presently being prepared, which will be included in "Staying on Track" management support series produced by ILRU.

Ongoing TIRR Research

Descriptive Title of the Activity: Personal Assistance: Its Effect on the Long-Term Health of a Rehabilitation Hospital Population

Investigator(s)--Name and office telephone number:
Margaret A. Nosek, Ph.D. 713-520-0232

Descriptors: Personal Assistance Services, Activities of Daily Living, SCI, Physical Health

Principal research objectives/questions/problems, investigative approaches being taken.

The study is designed to test the hypothesis that personal assistance with activities of daily living significantly affects the ability of persons with severe physical disabilities to maintain good physical health after discharge from a rehabilitation hospital. Techniques of qualitative analysis were used to assess interview results based on the observations of 41 physicians, physical therapists, occupational therapists, social workers, and nurses in five rehabilitation hospitals.

A positive relationship was found between the adequacy of personal assistance and the ability of individuals disabled primarily by stroke, spinal cord injury, or traumatic brain injury to maintain good physical and mental health. The most commonly cited health problem was skin breakdown, followed by urinary tract infections, pulmonary infections, and contractures. Inadequate personnel assistance also led to extended hospital stays, threats to safety, poor nutrition, and poor personal hygiene. Reliance on family alone for assistance was considered inadequate, common adverse effects including burnout, family role changes, and economic strain. Persons with the best health combined assistance by relatives and unrelated persons. Recommended is the establishment of a comprehensive system capable of coordinating service delivery from home health agencies, independent living centers, and rehabilitation hospitals.

Results from this study have been published in the Archives of Physical Medicine and Rehabilitation, 1993, vol 73.

Ongoing TIRR Research

Descriptive Title of the Activity: Profiles of Independent Living Centers that Provide Services to Rural Areas

Investigator(s)--Name and office telephone number:

Margaret A. Nosek, Ph.D.	713-520-0232
Carol A. Howland	713-520-0232
Earl Walden, D.Ed.	713-520-0232

Descriptors:

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

The purpose of this study is to define the characteristics of independent living centers that provide services to persons with disabilities residing in rural areas, to identify rural centers that provide exemplary services in the five most problematic areas, and to choose demonstration sites for implementing exemplary practices.

Surveys were mailed to 296 centers identified as providing services to rural areas, with 123 centers responding. Using Delphi techniques, executive directors of the centers identified the five greatest problems faced by rural centers as transportation, housing, attitudes, funding, and accessibility. Five monographs describing solutions to these problems by exemplary centers have been written and will be published by ILRU.

Using cluster analysis, three profiles of centers providing services to rural areas were identified -- Prototype (n = 77, most common), Outreach (n = 13, most travel to outlying areas), and Peak Expenditure (10, most atypical) -- according to five criteria -- 1) The total annual budget in proportion to the number of consumers served, 2) The percentage of staff time spent providing services in consumer's homes rather than at the center, 3) The number of miles traveled to deliver in-home services in proportion to the number of staff traveling annually, 4) the number of miles traveled to deliver in-home services in proportion to the number of consumers served annually, and 5) The number of information and referral requests received during the past fiscal year. Of the 123 respondents, 100 of the centers met the criteria for one of the three profiles. Overall differences between profiles were highly significant at $p<.00001$. Plotting of the profiled centers on a map of the United States demonstrated the majority of rural centers are in the northeastern and midwestern states, with the fewest in southeastern and south central areas. An article presenting the results of this study and its applications is in progress.

5. Orthotics and Prosthetics

Ongoing TIRR Research

Descriptive Title of the Activity: Artificial Finger Joint

Investigator(s)--Name and office telephone number:
Thomas A. Krouskop, Ph.D. 713-797-7035

Descriptors: Implantable material

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

This project is directed toward using new space age composite materials in the development of a new internal joint replacement for the fingers of persons who suffer the crippling effects of rheumatoid arthritis and traumatic injuries of the hand that render the finger joints useless.

Currently, the only finger joint prosthesis on the market is a silicone rubber device produced by Dow Corning and because it has an expected life of less than a year, it is being taken off the market. This leaves an open market for over 60,000 units per year. This project is projected to be a five year program that will result in a patentable device that has significant market potential. The dive proposed to be developed in this project will be fabricated from a carbon-carbon composite material for making percutaneous devices for transmitting power across the skin as for an artificial heart. This material has been developed by our research group in conjunction with Fiber Materials, Inc., a carbon material supplier located in Maine. By making the prosthesis from carbon, the problems inherent with metal, strength that decreases with use, is eliminated and the composite material that can have developed permits tissue to grow into it to stabilize it relative to the surrounding tissue. Moreover, the mechanical properties of the carbon-carbon composite can be engineered to be very similar to those of bone so the deformation in the prosthesis will closely match the deformation in the surrounding bone. By matching the deformations in the two materials, the boundary between the finger bone and the joint prosthesis will remain stable and the potential for carbon to wear through the bone, as metal parts do, is minimized. Animal experiments with pieces of carbon material placed in the shafts of the long bones has demonstrated that the material can be effectively interfaced with bone with no detectable problematic long-term (40 months) effects.

A series of prototype prostheses will be implanted in casts to assess the in vivo performance of the patented design.

Ongoing TIRR Research

Descriptive Title of the Activity: The Next Generation of Myoelectric Prosthesis

Investigator(s)--Name and office telephone number:
William H. Donovan, M.D. 713-797-5912
Diane J. Atkins, OTR 713-797-5239

Descriptors:

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

This two-year project seeks to evaluate use, user needs and practices, and further considerations for the use of myoelectric prostheses. This epidemiologic study will look specifically at accomplishing the following three goals: 1) establish and maintain a national database on children and adults with upper limb amputations, 2) characterize the wrist and hand functional parameters that are most important to children and adults with upper extremity amputation of one or both limbs; and 3) identify strengths and weaknesses of available upper limb prosthetic devices as perceived by persons with amputations.

6. Rehabilitation Engineering

Ongoing TIRR Research

Descriptive Title of the Activity: A Disposable Pressure Reducing Pad for the Operating Room

Investigator(s)--Name and office telephone number:
Thomas A. Krouskop, Ph.D. 713-797-7035

Descriptors:

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

There are no pressure reducing products currently on the market that have been designed to fulfill the special requirements of the operating room environment. At the present, if pressure relief is considered, foam mattress overlay material is used on the operating room table. In some orthopedic procedures, a bean bag is used to position the patient but the device is too small to provide pressure relief. However, it is not disposable. The product being developed in this project will provide effective pressure relief, will be burnable, will be environmentally safe, and will not interfere with radiological procedures that need to be done in the operating room. This product has been designed for short term use, only in the operating room and possibly in the recovery room. If long-term pressure relief is needed, other commercially available products would be used.

Ongoing TIRR Research

Descriptive Title of the Activity: An Ultrasonic Technique to Noninvasively Measure the Stiffness of Soft Tissue-Assessment of Ulcerated Tissue

Investigator(s)--Name and office telephone number:
Thomas A. Krouskop, Ph.D. 713-799-7035

Descriptors:

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

This project involves measuring the elastic modulus (stiffness) of normal and ulcerated tissues and identifying a normal range for it. This will allow areas of deterioration which are present early in the process of ulceration to be recognized before severe damage occurs or usual clinical observation identifies them. Additionally, treatment efficacy can be evaluated by monitoring the changes in the modulus over time, noting differences in healing time for each treatment. This study will include instrumentation development and preliminary subject testing to prepare for more extensive testing at a later date.

7. Rehabilitation Research Training

Ongoing TIRR Research

Descriptive Title of the Activity: Rehabilitation Research Career Development Fellowship Program

Investigator(s)--Name and office telephone number:
Thomas A. Krouskop, Ph.D. 799-7035

Descriptors: Research training

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

Supported by a grant from the National Institute on Disability and Rehabilitation Research, this program is in its sixth year of operation. Structured research experience and training is provided that is designed to equip a medical rehabilitation professional to function as an independent investigator.
Candidates with advanced degrees (M.D. or Ph.D.) are selected from the areas of medicine, nursing, physical therapy, rehabilitation counseling, social work, psychology, engineering, or occupational therapy. Mentors work closely with fellows who work in two of the following areas: cardiac rehabilitation, brain injury rehabilitation, independent living, rehabilitation engineering, or rehabilitation services research.

8. Sexuality

Ongoing TIRR Research

Descriptive Title of the Activity: Sexuality Issues Among Women with Physical Disabilities

Investigator(s)--Name and office telephone number:

Margaret A. Nosek, Ph.D.	713-520-0232	Mary Ellen Young, Ph.D.	713-666-9550
Diana H. Rintala, Ph.D.	713-960-1233	Catherine Foley, Ph.D.	713-666-9550
Carol Howland	713-520-0232	Jama L. Bennett, M.Ed.	713-520-0232

Descriptors:

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

Research has been conducted on the physiological aspects of sexuality in women with physical disabilities; however, little has been done to examine the psychosocial influence that physical disability has on the development of intimate relationships and the abilities of women with various physical disabilities to pursue behaviors typically taken for granted by women without disabilities, including dating, physical intimacy, marriage, and parenting.

Funded by NIH for three years, this project is designed to examine the broad spectrum of sexuality issues among women with a variety of physical disabilities.

Using a semi-structured interview format, thirty women with physical disabilities (including polio, spinal cord injury, traumatic brain injury, arthritis, neuromuscular disorders) are being interviewed. Participants were selected to achieve a balance of disability types, ages at onset, current age, marital status, sexual orientation, and racial and ethnic backgrounds. Interviews are conducted in the participants' homes and last approximately two hours by project staff who are also women with disabilities.

The interviews are tape recorded and transcribed and coded independently by two staff members. The data are coded into 19 basic domains of sexuality, such as sense of self, sex education, family relationships, abuse, dating, marriage, parenting, societal barriers, health issues, and sexual functioning. At this writing, data analysis is in progress. Preliminary analysis indicates that there are emerging themes related to parental attitudes and the development of self concept in the area of sexuality, age at onset of disability related to delay and difficulty in establishing intimate relationships, physical barriers to the process of bonding with children, numerous physical and attitudinal barriers to receiving appropriate gynecological and obstetrical care, and the effects of public stereotypes about the asexuality of women with disabilities.

Based on interview results, study questions will be developed for a major, national survey of 1200 women--600 women with physical disabilities and their best, non-disabled female friends. Participants will be recruited for this survey through twenty independent living centers around the country. This survey will collect data on the sexual functioning of women with physical disabilities as compared to women without disabilities. The results of this study will be used in developing and modifying educational and counseling programs for assisting women with physical disabilities in pursuing a full range of life options.

9. Skin

Ongoing TIRR Research

Descriptive Title of the Activity: Analysis of Reported Pressure Sore Management in Persons with Spinal Cord Injury

Investigator(s)--Name and office telephone number:
Susan L. Garber, M.A., OTR 713-797-5954

Descriptors:

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

It is hypothesized that persons with SCI have limited knowledge about pressure sores in general and what knowledge they do possess is not translated into effective preventive or management behaviors/regimens. Factors that impact on inadequate pressure sore identification and management will be determined.

Subjects will be persons with SCI (30) who are referred to the outpatient plastic surgery/tissue pressure management clinic at TIRR. They will include males and females over the age of 18, who present with at least a grade I pressure sore. All subjects will be referred because of a new sore. An oral questionnaire will be used during an indepth interview. Demographic, medical and functional data (such as sex, age, level and completeness of injury, date of SCI onset, prior tissue history sores, surgery), major equipment used (wheelchair, cushion, sliding board), assistance required to perform ADL, and educational/vocational status will be recorded. Open-ended questions will be used to determine subjects' knowledge about pressure sore identification and the specific actions taken once the sore was detected.

Ongoing TIRR Research

Descriptive Title of the Activity: An Analytical Service Demonstration of the Role of Biochemical and Behavioral Indicators in the Prevention of Recurrent Pressure Sores

Investigator(s)--Name and office telephone number:
Gladys P. Rodriguez, Ph.D. 713-798-5091
Susan L. Garber, M.A. 713-797-5954

Descriptors: Pressure Ulcers, Skin Collagen, Skin Care Practices, Health Belief Models

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

The principal objectives are to verify the predictive validity of the urinary excretion of glucosyl-galactosyl hydroxylysine (glu-gal-Hyl), a collagen metabolite in forecasting skin breakdown; to confirm the role of daily skin inspections in preventing the recurrence of pressure ulcers; and to verify the predictive validity of the Health Beliefs Model in forecasting adherence to daily skin inspection.

This will be an observational, prospective, cohort study. Patients will be randomly assigned to one of two groups: a control group which will be interviewed and will have a urine sample analysis only at the beginning and at the end of the study, and an experimental group which will have a urine sample analysis and an interview at monthly intervals. Patients will be followed for two years or until they develop a grade II ulcer.

Twenty control and 40 experimental patients have been enrolled. Sixteen patients have developed pressure ulcers. Preliminary analysis of the data acquired so far shows that race, age, body mass index, injury level, smoking habit, and initial urinary creatinine and glu-gal Hyl values were not significantly different for those subjects that developed ulcers compared to those that did not. But, the development of a pressure ulcer was associated with a sudden large increase in the urinary concentration of glu-gal Hyl.

Pressure sore prevention programs emphasize combinations of activities intended to reduce the risk of sores. Because there has been a lack of objective data demonstrating that adherence to such regimens reduces the occurrence of sores or which activity, if any, substantially decreases the risk, a survey was conducted to determine what the person with a spinal cord injury (SCI) believes about pressure sores and what, in fact, he is actually doing regularly to prevent them. A questionnaire was administered to 52 males with SCI and a prior history of sores. Questions were designed to elicit their spontaneous responses regarding sore prevention and also information regarding their beliefs about traditional methods of prevention. Eighty three percent believe they are not likely to develop another sore; 61% believe sores are life-threatening. Prevention methods believed to be most effective are using the right wheelchair cushion, good hygiene, skin inspection, and weight shifts or turns. There does not seem to be a correlation between what subjects believe prevent pressure sores and what they spontaneously report they are doing to prevent them, except with regard to weight shifts or turns. These results have enabled patient educators to critically re-evaluate hospital-based programs designed to teach the SCI patient pressure sore prevention.

Data gathering for this project has been completed. Analysis of the data is now taking place.

Ongoing TIRR Research

Descriptive Title of the Activity: Enhancing Self-Management Techniques for Preventing the Occurrence or Progression of Pressure Sores

Investigator(s)--Name and office telephone number:
Susan L. Garber, M.A., OTR 713-797-5954
Karen A. Hart, Ph.D. 713-797-5940

Descriptors:

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

The primary objective of this project is to develop and evaluate a multi-media educational program and follow-up effort aimed at teaching persons with spinal cord injury how to prevent and/or curtail the progression of a pressure sore. Our assumption is that many of these persons are familiar with skin breakdown prevention techniques but they are not translating that information into effective prevention and management behaviors. An attempt will be made to design and evaluate an instructional package that encourages adoption of practical techniques for maintaining the skin's integrity over a reasonably long period of time. The content and format of the educational material will be determined from results of a companion study which has received IRB approval and which is now being implemented. It will yield information on how persons with spinal cord injury detect a pressure sore, how they manage it once it is identified, and the barriers to effective prevention and management.

Ongoing TIRR Research

Descriptive Title of the Activity: A Randomized Double-Blind Controlled Trial of Platelet Derived Growth Factor (PDGF) in the Management of Pressure Ulcers

Investigator(s)--Name and office telephone number:

Saleh Shenaq, M.D.	713-798-6310
Susan L. Garber, M.A., OTR	713-797-5954
Beth O'Neill, R.N.	793-799-6935

Descriptors:

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

The aim of this trial is to evaluate the safety and efficacy of three different doses of PDGF in pressure ulcer management.

The primary hypothesis to be tested is that PDGF speeds the healing of full thickness pressure ulcers.

This is a randomized, placebo controlled, double-blind, parallel group phase II dose finding study. The study is multicenter in design in order to provide access to sufficient patients within a reasonable period of time. Randomization and blinding are used conventionally to minimize all types of bias. The total study duration is up to 13 weeks and consists of a one week single-blind run-in followed by a double-blind period that lasts until complete healing or 12 weeks of treatment, whichever occurs first.

10. Spinal Cord Injury

Ongoing TIRR Research

Descriptive Title of the Activity: Aging in Relation to Spinal Cord Injury

Investigator(s)--Name and office telephone number:

Diana H. Rintala, Ph.D.	713-960-1233
David Cardus, M.D.	713-798-5666
Karen A. Hart, Ph.D.	713-797-5940
Rebecca Clearman, M.D.	713-799-5052

Descriptors: Spinal Cord Injury, Aging

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

This project is part of the Rehabilitation Research and Training Center in Community-Oriented Services for Persons with Spinal Cord Injury.

Its goal is to determine how the status of persons with spinal cord injured persons in six different life domains (physical well-being, psychological well-being, social integration, independence, productivity, and economic self-sufficiency) and on five moderating factors (social support, health beliefs and practices, environmental supports, perceived control, and mobility) is affected by the time-related variables of chronological age, duration of injury, age when injured, and era when initial rehabilitation services were provided. Another goal is to obtain prospective, longitudinal data regarding how persons with spinal cord injury change over a three-year period in each of the six life domains and four moderating factors according to differences in the duration of injury and age when injured.

The study is guided by a 2 x 2 x 2 factorial analysis of variance design. The first factor, time when assessed, will involve two waves of data collection separately by approximately three years. The second factor, duration of spinal cord injury, will contrast participants with relatively short and long durations of injury. The third factor, age at onset, will contrast participants who were injured relatively early and late in life. The design goal is to have 25 persons in each of the four cells yielded by the combination of the two durations and the two ages when injured. Participants were selected on a random basis from the registry ("SCI CENSUS") from which participants in the center's life status study were also drawn.

The first wave of data collection was completed in January, 1991 and the second wave will be completed by July, 1993. Preliminary analyses are underway.

Ongoing TIRR Research

Descriptive Title of the Activity: Clinical Manifestations of Sub-Clinical Brain Influence in Clinically Complete Spinal Cord Injury

Investigator(s)--Name and office telephone number:

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Milan R. Dimitrijevic, M.D.	713-798-3649
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Barry McKay	713-798-5156
Stephen M. Tuel, M.D.	713-798-6197

Descriptors: Spinal Cord Injury, Neurophysiology

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

Past research has indicated that there are several different reflex mechanisms dependent upon supra spinal brain influence. This is the basis for the neurophysiologic description of a "discomplete spinal cord injury" which is a clinically complete spinal cord injury with neurophysiologic evidence of preserved supra-segmental pathways. Research to date has shown this to be a highly prevalent phenomenon among clinically complete spinal cord injury patients. However they have not yet succeeded in defining other associated clinical profiles of these patients. The purpose of this project is to gather data about these patients, clinical presentation to augment the clinical usefulness of these neurophysiologic investigations and to aid in predicting certain complications of spinal cord injury.

Ongoing TIRR Research

Descriptive Title of the Activity: A Comparative Longitudinal Study of Rehabilitation Outcomes for Women and Men with Spinal Cord Injury

Investigator(s)--Name and office telephone number:
Diana H. Rintala, Ph.D. 713-960-1233

Descriptors: Spinal Cord Injury; Rehabilitation Outcomes; Gender

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

Conducted under auspices of the Texas Model Spinal Cord Injury System, this study addresses the acknowledged void of scientifically validated information about the rehabilitation-related needs and outcomes that distinguish men and women who incur spinal cord injury. Using a prospective longitudinal design, similarities and differences between women and men undergoing inpatient rehabilitation and follow-up services will be documented in terms of functional recovery, prevalence and severity of secondary complications, psychological well being, and utilization of services. Variables to be monitored that are distinctive to women will include selective aspects of social role performance, sexuality, and obstetrical and gynecological status. A related objective is to identify similarities and differences between women and men in their pre-injury characteristics and characteristics of their inpatient rehabilitation experience that forecast post-discharge health status, degree of disability, social role performance, as well as the kinds and extent of service utilization.

A minimum of 30 females who are admitted for rehabilitation into the Texas Model Spinal Cord Injury System are being matched with the same number of male patients in terms of level and completeness of spinal cord injury, age at injury, and pre-injury vocational/educational status. In addition to data that reflect participants' inpatient rehabilitation experience, follow-up data are being obtained at 6-, 12-, and 24-months post-injury. Data acquisition began in November, 1990.

Ongoing TIRR Research

Descriptive Title of the Activity: Factors Influencing the Risk of Spinal Cord Injury

Investigator(s)--Name and office telephone number:

R.Edward Carter, M.D.	713-797-5910
Dan Graves, B.S.	713-799-5203
Teresa Giles	713-797-5910

Descriptors: Spinal Cord Injury, Etiology, Risk Factors, Injury Prevention

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

This project is designed to explore the activities and factors preceding an injury event. In recent years there have been several acts of legislation designed to increase the safety of motor vehicle travel (i.e., seatbelt laws, passive restraint systems and DWI awareness programs). There has also been an increase in the number and quality of injury prevention programs. It is the purpose of this study to investigate the factors preceding the injury event in order to better understand and guide injury prevention intervention.

The data for this investigation will be gathered from all spinal cord injury patients that are admitted to TIRR for rehabilitation. The data will include demographic, geographic information as well as medical and personal history. The injury event information collected will be specific to the type of event. Sports, motor vehicles and violence are major categories for injury events.

The initial data collection was instituted in August, 1992. A preliminary report is expected in the last quarter of 1993.

Ongoing TIRR Research

Descriptive Title of the Activity: Health Services Utilization by Persons with SCI

Investigator(s)--Name and office telephone number:

Era Buck, Ph.D.	713-960-1233
Diana H. Rintala, Ph.D.	713-960-1233
Karen A. Hart, Ph.D.	713-797-5940
Rebecca Clearman, M.D.	713-799-5010

Descriptors: SCI, Health Services Research

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

This is a follow-up study to the larger study of the life status of persons with SCI. In the original study, 100 men with SCI received a comprehensive medical screening and mailed recommendations based on the findings. Three to six months later investigators of this study contact each person to ascertain whether they have taken any action as a result of those recommendations. Information is gathered regarding the types of providers and settings utilized if any in response to the recommendations. Subjects are also asked to identify any barriers they encountered while seeking health services.

Ongoing TIRR Research

Descriptive Title of the Activity: The Influence of Caregiver Well-Being on Outcomes for Persons with Spinal Cord Injury

Investigator(s)--Name and office telephone number:
Diana H. Rintala, Ph.D. 713-960-1233
Jann E. Dodd, M.A.
Mary Ellen Young, Ph.D. 713-666-9550

Descriptors: Social Support, Demands of Caregiving, Caregiver Well-Being

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

The objective of the study are a) to investigate the relationship between the well-being of primary caregivers and the status of the persons with SCI for whom they care, in a number of life areas; b) to investigate the impact of the objective and perceived demands of care on the caregivers' physical and psychological well-being, productivity, and social integration; and c) to identify factors that may moderate the impact of the demands on the caregivers.

Two wives of husbands with SCI already have participated and the parents who care for two other men with SCI are to be recruited in the near future. Both quantitative and qualitative data are being collected. These include reports of daily activities, social network, depression, stress, health maintenance habits, life satisfaction, and status in several life areas. The qualitative data are obtained via at least two in-depth interviews with each participant. These interviews are semi-structured through the use of an interview guide designed to focus the discussion on the topics of interest. An emphasis is being placed on caregiving experiences and emotional reactions to these, as well as social support available.

The data from the wives have shown the high degree of commitment these women have toward assuring their husbands' well-being and the feelings of both sacrifice and accomplishments they have. The data is incredibly rich and further analyses are in progress.

Ongoing TIRR Research

Descriptive Title of the Activity: Interventional Pain and Spasticity Management

Investigator(s)--Name and office telephone number:
William H. Donovan, M.D. 713-797-5012
Raj K. Narayan, M.D. 713-798-4111

Descriptors: Intrathecal Pharmacology

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

1. Intrathecal pharmacology; using implantable infusion reservoirs and intrathecal catheters, preceded by a temporary percutaneous trial.

a. Intrathecal baclofen for control of long-term spasticity in patients with spinal cord injury, also recently expanded to include patients with head injury.

b. The use of pharmacologic agents for control of pain such as narcotics, baclofen and other agents.

Ongoing TIRR Research

Descriptive Title of the Activity: Life Status Study of Persons with Spinal Cord Injury

Investigator(s)--Name and office telephone number:

Diana H. Rintala, Ph.D.	713-960-1233
Karen A. Hart, Ph.D.	713-797-5940
Rebecca Clearman, M.D.	713-799-5010
David Cardus, M.D.	713-798-5666

Descriptors: Spinal Cord Injury, Post-Rehabilitation Needs

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

This project is part of the Rehabilitation Research and Training Center in Community-Oriented Services for Persons with Spinal Cord Injury. Its goal is to portray systematically the life status and service needs of persons with spinal cord injury who reside in the community. Six life domains are being investigated--physical well-being, subjective well-being, social integration, independence, productivity, and economic self-sufficiency. Individual differences in each life domain are being explored as a function of individual difference variables particular to spinal cord injury (e.g., level and duration of injury to the spinal cord) and variables that apply to the general population (e.g., educational attainment and gender). Measures are also being obtained on five variables that are posited to moderate the relationships between the individual difference variables and the life domains. The moderating variables are social support, health beliefs and practices, environmental supports, perceived control of one's life, and mobility. Where possible, measures have been chosen for which norms are available for the general population so that comparisons can be made.

Using a multiplicity of publicity channels and recruiting methods, a cohort was established of persons with spinal cord injury who reside in a 13-county area in Southeast Texas that surrounds and includes the cities of Houston and Galveston. A probability sample of 140 persons was drawn from the cohort of approximately 661 individuals. Following a home visit that included an interview and completion of a variety of self-administered instruments, participants underwent a day-long assessment at The Institute for Rehabilitation and Research that included a physical examination, clinical laboratory assessments, xrays, a renal scan, and provocative cardiopulmonary evaluation.

Data collection has been completed and data analyses are proceeding.

Ongoing TIRR Research

Descriptive Title of the Activity: Long-Term Follow-Up of Equipment Utilization by Persons with Spinal Cord Injury

Investigator(s)--Name and office telephone number:
L. Don Lehmkuhl, Ph.D. 713-666-7323

Descriptors:

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

The purposes of this study are to: a) obtain reliable follow-up information on equipment utilization by persons with spinal cord injury many years after onset of injury; b) assess the adequacy with which equipment needs of persons with SCI are being met; and c) provide recommendations for meeting current equipment needs.

Subjects were drawn from a SCI CENSUS targeted upon persons with spinal cord injury who reside in a 13-county area of Texas with a population of more than 3.3 million persons. As of this writing, a total of 610 individuals have been enrolled in the SCI CENSUS. Eighty percent of them are male and 20% are female. The majority are caucasian (70%) and the average age at onset of injury was 28 years. The most frequent cause of injury was motor vehicle accidents (41%), next was acts of violence (21%), then sports (16%). Twenty two percent of subjects could walk to some extent; 46% of them had function of hands or arms impaired by the injury. Over half of the subjects can drive their own vehicle independently, only about 20% ride public transportation. One hundred male subjects in the CENSUS were randomly selected to come to our rehabilitation center for a day-long set of examinations, including interview with a physical therapist to assess equipment utilization. Data have been collected on 91 of these subjects to date. The following items of equipment are specifically addressed in the study: sliding board, shower-commode chair, tub bench, bedside commode seat, elevated commode seat, grad bars, hospital bed and rails, transfer aids, mobile arm supports, hand splints, wheelchair controls, environmental controls, braces, walkers, crutches, canes, stall bars, wheelchairs, and wheelchair accessories and cushions. Subjects were classified into four groups on the basis of the motor level of function determined in the current neurological examination. The four levels are: C1-C6 (N=27); C7-T1 (N=23); T2-T10 (N=21); and T11-S5 (N=18). Equipment utilization of each group is compared using descriptive statistics.

Ongoing TIRR Research

Descriptive Title of the Activity: Rehabilitation Research and Training Center in Community-Oriented Services for Persons with Spinal Cord Injury

Investigator(s)--Name and office telephone number:

R.E. Carter, M.D.	713-797-5910
Diana H. Rintala, Ph.D.	713-960-1233
Karen A. Hart, Ph.D.	713-797-5940

Descriptors:

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

Supported by a grant from the National Institute on Disability and Rehabilitation Research for the period 1988-1992, this center conducts an integrated program of research, training, and service demonstrations that are designed to improve the health maintenance, psychological adjustment, and community reintegration of persons with spinal cord injury who have resumed their lives in the community after receiving acute rehabilitation services. A related goal is to investigate the aging process in persons with spinal cord injury and to identify changing needs for medical care, psychological services, and adaptive equipment. The center also provides training to individuals with spinal cord injury and their family members on the home-based management of pain; financial reimbursement; health insurance; new techniques and devices for communication; and recruiting, training and financing for personal care assistants. The center serves as a national spinal cord injury resource and information center on innovations in follow-up care, psychological and social adjustment, community reintegration, financial management, management of attendant care, vocational preparation, and employment.

The center's component research projects are described separately in this guide.

Ongoing TIRR Research

Descriptive Title of the Activity: Texas Regional Spinal Cord Injury System

Investigator(s)--Name and office telephone number:
William H. Donovan, M.D. 713-797-5912
R. Edward Carter, M.D. 713-797-5910

Descriptors: Spinal Cord Injury

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

The Spinal Cord Center at TIRR has been a federally designated Model Regional Spinal Cord System for 17 years. The goals of the system are to:

1. Operate a multidisciplinary system of services that meets the special needs of persons with spinal cord injury, including emergency medical services, acute care, rehabilitation services, and long-term community follow-up services that emphasize vocational rehabilitation and health maintenance;

2. Demonstrate the benefits of a regional system of services for persons with spinal cord injury;

3. Establish within the system a research environment that supports investigator-initiated and collaborative research intended to solve problems encountered in the medical management and rehabilitation of persons with spinal cord injury;

4. Demonstrate and evaluate improved methods and equipment for the rehabilitation of persons with spinal cord injury;

5. Demonstrate improved methods of community outreach and education for persons with spinal cord injury in areas such as transportation, employment, and other community activities;

6. Contribute to a national database relevant to demonstrating the aggregate impact of the systems nationwide.

Topics of the system's research projects include: incidence of respiratory complications following spinal cord injury, effects of bullet fragments retained in the spinal canal, database for injury prevention, and the molecular epidemiology of gram negative bacilli colonization/infection in spinal cord injury patients.

Ongoing TIRR Research

Descriptive Title of the Activity: The Use of Plasmid DNA Analysis to Determine the Source of Bacterial Invasion of the Urinary Tract

Investigator(s)--Name and office telephone number:
William H. Donovan, M.D. 713-797-5912
Richard Hull, Ph.D.

Descriptors:

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

The epidemiology of bacterial colonization of the stool and urine of SCI patients is extremely complex. Plasmid DNA analysis and careful microbiological examination provide an excellent means of assessing the relationship between transmission of a bacterium from a reservoir to a target area. Klebsiella pneumoniae is readily studied with these techniques, and most appears to be spread from the feces to the urine in most SCI patients undergoing intermittent catheterization. Even episodes of repeat urinary colonization with the same strain of bacterium (relapsing) seems to be often directly related to a bowel reservoir. Therefore, when no cause for relapsing bacteriuria can be found in the GU tract, patients may be safely treated expectantly as symptoms warrant, since the source is probably from the bowel. The length, routine or specific class of antibiotic treatment do not appear to be a major determining factor in the spread of this organism. Antibiograms may provide a reliable means of evaluating the nature (i.e, the same versus a different strain of a particular species) of repeated bacterial colonization since they correlate extremely well with strain differentiation by plasmid analysis. Further research in this area is vital.

Ongoing TIRR Research

Descriptive Title of the Activity: Variations in Readiness for Alternative Vocational Rehabilitation Services Among Persons with Spinal Cord Injury

Investigator(s)--Name and office telephone number:
Mary Ellen Young, Ph.D. 713-666-9550
Wayne G. Alfred, M.A. 713-799-6993

Descriptors: Vocational Rehabilitation, Spinal Cord Injury, Vocational Readiness

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

Objectives:

1. To assess levels of vocational readiness among a cross-section of spinal cord injured persons who are unemployed and who are two or more years post-injury.
2. To study the correlates of vocational readiness in terms of age, time since injury, education, severity of disability, and other relevant variables obtained from the life status study (R-1)
3. To identify perceived vocational rehabilitation service needs among unemployed spinal cord injured persons of varying vocational relevance.
4. To develop recommendations for rehabilitation strategies to spinal cord rehabilitation centers, state VR agencies, and independent living centers aimed at fostering higher levels of vocational readiness among unemployed spinal cord injured persons.

Research Design:

The data for this study were to be collected as part of the Life Status Study (R-1). Data were derived from questionnaires, a home interview, and a comprehensive physical examination conducted at a rehabilitation hospital. A sample of 140 persons was drawn randomly from a community-based sampling frame of 640 persons with spinal cord injury.

Results to Date:

Categorically, the results revealed that 27% of the subjects were gainfully employed, 35% in unpaid productive activities, and 38% unemployed. Vocational status was significantly correlated with gender, ethnicity, education, and disability (as measured by a self-report version of the Functional Independence Measure--FIM). Stepwise logistic regression analysis revealed that persons who were more educated and less disabled were more likely to be employed. Gender, ethnicity, and time since onset of injury were not significant predictors of employment.

Implications of the Findings:

The present study was designed to avoid limitations of previous studies which focused largely on persons who had been recently injured or who were nor far removed from their rehabilitation experience. Specifically, the sample was drawn from a cross-section of persons with spinal cord injury living in the community, including persons who had lived with their injury for many years (up to 48 years).

Ongoing TIRR Research

Descriptive Title of the Activity: Ventilatory Dependent Spinal Cord Injury Registry

Investigator(s)--Name and office telephone number:

R. Edward Carter, M.D.	713-797-5910
Dan Graves, B.S.	713-799-5903
Francine Mechoulam	713-797-5908

Descriptors: Spinal Cord Injury, Mechanical Ventilation, Electrophrenic Respiration, Apnea

Principal research objectives/questions/problems, investigative approaches being taken, and highlights of findings for projects that are partially or wholly completed.

In the past several years, the frequency of ventilator dependent spinal cord injured patient admissions has been escalating due in part to greater general public knowledge of cardiopulmonary resuscitation, outlying hospitals equipped with better respiratory equipment, proliferation of trained emergency technicians, and advances in respiratory therapy skills and equipment. At The Institute for Rehabilitation and Research (TIRR), ventilator dependent patients comprise approximately 4% to 4.5% of almost 3,000 spinal cord injury patients. No single facility has a large enough number of experience with this type of patient to forecast their respiratory needs, maintenance, and ultimate outcome. Therefore, we propose that a separate centralized data base for this subgroup of the spinal cord injured is in order.

The data base will be organized on a computer at the TIRR Spinal Cord Injury Center. The initial form I will contain basic demographic information and cover the initial management and discharge plans. The follow-up forms II will contain questions on equipment, morbidity, etc., that must be obtained by telephone from the patient and/or family three times a year after discharge. Patients to be included in the study will be those with apnea or near apnea secondary to cervical spinal cord injury or damage and discharged from a rehabilitation facility as totally ventilator dependent.

Operational objectives are: to determine the survival rate of spinal cord injured patients discharged from initial rehabilitation facilities totally ventilatory dependent; to determine the reliability of equipment; to determine morbidity; to ascertain place of residence; to estimate quality of life and community re-integration; and to determine the potential for personal productivity.

11. List of Completed or Discontinued Projects

List of Completed or Discontinued Research Projects by Title Only

Completed Projects

Adrenergic Receptors in Insensitive Skin of SCI Patients
Gladys P. Rodriguez, M.S.; Samuel S. Stal, M.D.

An Analysis of Traumatic Amputee Etiology
William H. Donovan, M.D.

Arrangements for Receiving Personal Assistance Services
Margaret A. Nosek, Ph.D.; Marcus J. Fuhrer, Ph.D.; Diana H. Rintala, Ph.D.; Karen A. Hart, Ph.D.

Assessment, Development, and Clinical Applications of Strategies to Coordinate Services for SCI Clients After Discharge
Diana H. Rintala, Ph.D.

Assessment of Device Utilization
Susan L. Garber, M.A., OTR

Automated Fabrication of Lower Extremity Prosthetic Sockets
Thomas A. Krouskop, Ph.D.

Biopharmaceutics of Dantrolene Sodium
Stuart Feldman, Ph.D.; Suryanarayana Sister, B.S.; William H. Donovan, M.D.

Body Fluid Shifts in Spinal Cord Transection and Simulated Microgravity
David Cardus, M.D.; Wesley G. McTaggart

Circulatory Effects of Low Frequency Neuromuscular Stimulation
Paul G. Loubser, M.D.; David Cardus, M.D.; Laurens Pickard, M.D.

Clinical Study of Pain Complaints and Effectiveness of Physical Therapy Interventions During Rehabilitation of Patients with Spinal Cord Injury
L. Don Lehmkuhl, Ph.D.; Marvin Schmoyer, P.T.; Mandy Smith, P.T.; Valerie Barbour, P.T.; Kathleen Williams, P.T.

Comparative Outcomes for Women and Men as Reflected by the National Spinal Cord Injury Database
Marcus J. Fuhrer, Ph.D.; C.D. Rossi, M.S.

Comparison of Neurodevelopmental Therapy and Traditional Methods of Treatment in Stroke Rehabilitation
Averll Overby, P.T.; L. Don Lehmkuhl, Ph.D.

Conformal Support System for Home Health Care
Thomas A. Krouskop, Ph.D.; Patti Barry

Consumer-Run Boards and Independent Living Centers
Laurel Richards; Quentin Smith; Alan Meyer; Laurie Gerken; Margaret A. Nosek, Ph.D.

The Definition of "Peer": Consumer Perspectives and Significance in the Delivery of Counseling Services
Margaret A. Nosek, Ph.D.; Marcus J. Fuhrer, Ph.D.; Laurie Gerken; Laurel Richards

Delivery of Peer Counseling Services in Independent Living Centers: A Study of National Trends
Laurel Richards; Margaret A. Nosek, Ph.D.; Marcus J. Fuhrer, Ph.D.; Laurie Gerken

Development of an Instrument to Measure Adequacy of Personal Assistance Services
Margaret A. Nosek, Ph.D.; Marcus J. Fuhrer, Ph.D.

Development of Materials for Percutaneous Passage
Thomas A. Krouskop, Ph.D.

Development of a Stress Testing Procedure and Reconditioning Exercise Program for the Patient with SCI
David Cardus, M.D.; Wesley G. McTaggart; Francisca Ribas-Cardus

Effect of Clonidine on Spasticity: A Clinical Trial
William H. Donovan, M.D.

Effect of Personal Assistance Services on Productivity and Daily Living Among Japanese with Severe Physical Disabilities
Margaret A. Nosek, Ph.D.

Establishment of a Ventilatory Dependent Registry
R. Edward Carter, M.D.

Evoked Spinal Cord and Nerve Root Potentials
L. Don Lehmkuhl, Ph.D.; Milan Dimitrijevic, M.D.; Arthur Sherwood, Ph.D.

Fertility in Spinal Cord Injured Men
William H. Donovan, M.D.; Larry Lipschultz, M.D.; Steven Shaven, M.D.

Functional Analysis of Control Interfaces for Communication and Mobility Devices
Thomas A. Krouskop, Ph.D.

Home Health Care Mattress System
Thomas A. Krouskop, Ph.D.

Identifying Leadership Development Needs for the Independent Living Field
Laurel Richards; Quentin Smith

Identifying Management Issues for Peer Counseling Service Delivery
Laurel Richards; Quentin Smith

ILRU Research and Training Center on Independent Living at TIRR
Marcus J. Fuhrer, Ph.D.; Laurie Gerken; Margaret A. Nosek, Ph.D.; Laurel Richards

Independent Living in Rural Areas: A Longitudinal Study
Margaret A. Nosek, Ph.D.; Laurie Gerken

An Innovative Modular Orthosis for Patients with Paraplegia
Thorkild Engen, C.O.; Many Smith, P.T.; L. Don Lehmkuhl, Ph.D.

Instrumental Social Support as a Buffer of Psychological Stress for Persons with Physical Disabilities
Marcus J. Fuhrer, Ph.D.; Margaret A. Nosek, Ph.D.

Laboratory Test to Predict and Monitor Bone and Skin Related Complications in Spinal Cord Injury
Jacqueline Claus-Walker, Ph.D.; Gladys P. Rodriguez, M.S.; R. Edward Carter, M.D.

Lysyl Hydroxylase Activity: Relationship to Skin Collagen Metabolism in SCI
Gladys P. Rodriguez, M.S.; Samuel S. Stal, M.D.

Neurological and Skeletal Outcomes in Patients with Cervical Spinal Cord Injuries
William H. Donovan, M.D.; R. Edward Carter, M.D.; Dennis Kopaniky, M.D.

Occupational Stress in Executive Directors of Independent Living Centers
Carol G. Potter, Rh.D.

Operational Definition of Independence and Construction of the Personal Independent Profile (PIP), An Assessment Instrument
Margaret A. Nosek, Ph.D.; Marcus J. Fuhrer, Ph.D.

Peer Counseling in Independent Living Centers: An Indepth Study of Service Delivery Models
Laurel Richards; Quentin Smith; Maggie Shreve

Physical Therapy Management of Combined Spinal Cord Injury
Carolyn Kelley, P.T.; Irene Schneider, P.T., L. Don Lehmkuhl, Ph.D.

Physical Therapy Management of Pain in Persons Experiencing the Late Effects of Poliomyelitis
Laura Smith, Ph.D.

A Pocket Size Interface Pressure Evaluator
Thomas A. Krouskop, Ph.D.; K. Filip, R. Ziegenhals

A Profile of Denials of Durable Medical Equipment for SCI Patients by Third Party Payers
William H. Donovan, M.D.; R.E. Carter, M.D.

Prospective, Longitudinal Assessment of Patients with Spinal Cord Injury Whose Comprehensive Rehabilitation Occurs in a Model Spinal Cord Injury System Versus Those Served Under Non-Systems Auspices
Marcus J. Fuhrer, Ph.D.; Diana H. Rintala, Ph.D.; Karen A. Hart, Ph.D.

Research and Training Center for the Rehabilitation of Persons with Spinal Cord Dysfunction
Marcus J. Fuhrer, Ph.D.; Karen A. Hart, Ph.D.

Role of the Atrial Natriuretic Peptide in Body Fluid Shift Regulation
David Cardus, M.D.; Francisca Ribas-Cardus, Juan Codina

Service Relationships Between Independent Living Programs and Medical Rehabilitation Programs
Marcus J. Fuhrer, Ph.D.; C.D. Rossi, M.S.; Margaret A. Nosek, Ph.D.; L. Gerken; L. Richards

Severity and Duration of Neurological Symptoms Following Mild Traumatic Brain Injury
Karen A. Fiffick, R.N, CRRN;, L. Don Lehmkuhl, Ph.D.; Catherine F. Bontke, M.D.

Vocational Evaluation for Quadriplegics with a High School Education or Less
Wayne G. Alfred, M.A.

Wheelchair Cushion Prescription
Susan L. Garber, M.A., OTR