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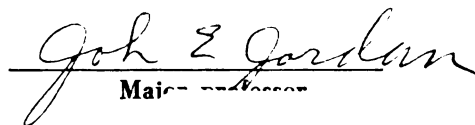
A Follow-up Study of Hemiplegic Patients  
Discharged from the Rehabilitation Institute  
of Chicago

presented by

Douglas E. Inkster

has been accepted towards fulfillment  
of the requirements for

Ed.D. degree in Guidance and Counseling

  
Major Professor

Date August 1-1965

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## ABSTRACT

### A FOLLOW-UP STUDY OF HEMIPLEGIC PATIENTS DISCHARGED FROM THE REHABILITATION INSTITUTE OF CHICAGO

by Douglas E. Inkster

This follow-up study presents an assessment of changes in function two years after discharge as observed in brain damaged patients 65 years of age or younger, whose medical records showed residual impairment of hemiplegia or hemiparesis at the time of discharge from the Rehabilitation Institute of Chicago. Detailed information obtained from case records, personal interviews and questionnaires with respect to the patient's ability to perform at the time of discharge and at follow-up was organized into a rating system relative to functioning in the 12 activity areas of: personal hygiene, eating, dressing, speaking, writing, walking, stair climbing, traveling, aids (canes, walker, and wheelchair), braces, social activities, and employment. Status at the time of the follow-up contact, based on specific criteria for change in functioning in each area, was classified as Improved, Static, or Regressed. Descriptive observations and impressions of personality were also recorded at the time of the interview. The data were reviewed as to possible factors with predictive value for success or failure of rehabilitation of certain types of cases.

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Douglas E. Inkster

Of the 100 cases selected only 64 could be located and 18 of these were deceased at the time of follow-up contact. Major results on status of the 46 cases comprising the study indicated that: (1) Observable personality changes of a regressive nature were usual among these brain damaged cases having residual hemiplegia. These changes appeared to be directly related to a reduction in motivation, and may have an organic base. (2) The most frequent measurable benefit to these hemiplegic patients from services in the Rehabilitation Institute concerned the ability to ambulate. (3) Post-hospital experiences of the patient and his family have substantial influence on maintenance and improvement of function after discharge. (4) Early inauguration of a functional management program correlates with greater returns of physical functions significant at the 1 percent level. (5) Demographic characteristics of hemiplegic patients appear to have little influence on their ability to maintain physical function after discharge. (6) Female hemiplegics under 55 years of age appear to have the best chance of maintaining and improving physical function. (7) The probability of a stroke with resulting hemiplegia appears to increase with age. (8) Valid determination of the vocational potential of hemiplegic patients is dependent on post-discharge services which are designed, implemented, and evaluated over a period of time.

A FOLLOW-UP STUDY OF HEMIPLEGIC PATIENTS  
DISCHARGED FROM THE REHABILITATION  
INSTITUTE OF CHICAGO

By  
Douglas E. Inkster

A THESIS

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for the degree of

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Counseling, Personnel Services,  
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College of Education

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## CHAPTER I

### INTRODUCTION

#### Background Statement

For centuries the stroke patient received only a shrug from the "collective shoulders" of the medical practitioners. It has only been within the last ten years that extensive study and development of treatment techniques for stroke patients has come on the scene. This activity has produced excellent schemata for immediate medical treatment following onset. Such early inauguration of an exercise program through physical and/or occupational therapy has been dramatically proven to be of vital importance in enhancing the return of lost muscle function. Although much attention is given to the physical impairment, there has been little concern for three other qualitative features of this disability; the emotional, social, and economic components. It is time rehabilitation professionals concern themselves with these other components of disability to determine how they might increase the capacity of the stroke patient to cope with the demands of his environment.

#### Nature of the Problem

Vocational rehabilitation counselors consider hemiplegic clients among the more severely impaired of their service public. Although residual skills and abilities are

often in evidence, a successful rehabilitation is difficult and frequently impossible to accomplish. A lack of motivation is the most common explanation heard. This study is an effort to examine a group of hemiplegic patients to discover any special characteristics that seem peculiar to the group and/or might explain or predict the limited vocational potential that seems to be so typical of the hemiplegic client.

The study group is made up of former patients of the Rehabilitation Institute of Chicago. The Institute is a hospital for the rehabilitation of physically handicapped individuals. Incorporated in 1951 and opened in 1954, the Institute has an inpatient capacity of 75 and an outpatient capacity of equal size. Staff and services are dedicated to the early restoration of amputees, paraplegics and others suffering from cardiac, arthritic, polio, and accident caused disabilities. The Institute provides physical, social, and vocational training for the physically disabled, comprehensive medical and paramedical evaluations, and treatment programs for inpatients and outpatients in physical, occupational and speech therapies, vocational testing and guidance, and psychological and social services. The Rehabilitation Institute of Chicago is housed in a six-story structure located at 401 East Ohio Street in Chicago. It is accredited by the joint commission for the accreditation of hospitals and it is an affiliated hospital of Northwestern University.

Community rehabilitation centers are a recent adjunct to medical services in this country. Their growth has been rapid. In many ways they parallel services provided in hospital settings, yet there are some distinct differences.

A wider variety of patients and services may often be found in the community rehabilitation centers. For example, speech services, vocational training, aid to the mentally retarded and social services unrelated to the business office are not usually found in a hospital rehabilitation program, although some hospitals do have such programs. The goals of rehabilitation centers are concerned with more than the physical aspects of disability. The range of "successful" inpatient treatment extends from the 70 year old who increases the function of arm and hand muscles so that he can again shave himself to improved vocational status and greater financial independence. In meeting the needs of the client, a rehabilitation center team recognizes that considerable overlap exists, since emotional, physical, and occupational factors are interrelated. In this research project we will try to define a disability as a type of disease complex with a specific etiology and a characteristic syndrome.

### Definitions

Utilizing a thesis developed by Dr. Bernard D. Daitz, it is possible to break down the qualitative features of disability as a health problem. Having done this, it is

a simple matter to apply this concept to a particular impairment such as hemiplegia and study the "disability syndrome" that is present. The following definitions will be used in discussing the data completed (6).

Disability. A distinct disease complex with a specific etiology and characteristic features which comprise a syndrome that can be prevented, limited, or reversed. Physical, emotional, social, and economic impairments comprise the major components of a disability syndrome. In most individuals affected by disability all four components are usually present in varying intensity and duration. Disability invariably reduces the capacity of an individual to cope with the physical, emotional, social, and economic demands of his environment.

Physical impairment. This term refers to the residuals which are found and are classified in two major categories: intrinsic residuals which are produced directly by disease process, trauma, or by genetic influences which may be modified in some instances by prosthesis, but generally are considered irreversible; and extrinsic residuals which comprise the impairments which result from disuse or atrophy. Extrinsic residuals are commonly found in patients who become immobilized as a direct or indirect consequence of disease, trauma, or congenital defeat.

Emotional impairment. This term refers to the residuals which reduces the capacity of an individual to cope with the emotional demands of his environment. This

limitation of emotional response may be due to intrinsic residuals, extrinsic residuals, or a combination of both.

Social impairment. This term refers to the reduced capacity of an individual to cope with social demands of his environment. This generally refers to an extrinsic residual having to do with social decrement.

Economic impairment. This term refers to the reduced capacity of an individual to cope with the economic demands of his environment. This too is generally an extrinsic residual having to do with economic decrement.

Functional management. This term is used to describe the means by which extrinsic residuals may be prevented, limited, delayed, or reversed. It consists of measures which are employed to influence the attitude and behavior of patients in order to help them preserve or develop adequate functional capacity. The concept of functional management encompasses three areas of application: (a) prevention of functional impairment; (b) minimizing or delaying functional impairment; and (c) reversing functional decrement.

Rehabilitation. Rehabilitation is that form of functional management by which the extrinsic residuals comprising the immobilization syndrome may be reversed, and the functional decrement produced by intrinsic residuals modified.

### Statement of the Problem

Follow-up is always one of the services listed as a necessary standard for any rehabilitation facility. There are very few, however, that have the time, staff and/or money to conduct an adequate follow-up program. Generally, these activities are carried out on a selective population for a specific purpose. This follow-up study is no exception to that rule.

It was the purpose of this study to assess the demographic, functional, and economic characteristics of certain hemiplegic patients of the Rehabilitation Institute of Chicago at the time of their discharge from the Institute and two or more years after discharge. The assessment was made by comparing inventoried items taken from the patient's file at the Rehabilitation Institute with inventory items obtained from a follow-up interview of these same patients. Changes in the following areas were specifically noted: physical function, activity, and economic state.

A Maintenance of Function Scale was developed to rate clients as improved, static, or regressed. These three groups were studied for characteristics which might be helpful in predicting success or failure in the rehabilitation of a particular client and incidentally to ascertain the results of the Institute program.

Approval and support for the development of this project was graciously given by the Rehabilitation Institute of



Chicago. It was agreed that the findings would be made available to the Institute for their information. All case data obtained from files and through interviews was to remain confidential. No patient's name was to be mentioned in the report and information obtained was to be treated statistically without reference to persons.

### Delimitations

This study was concerned with only those individuals; (a) who suffered cerebrovascular and neurological damage to the extent that the residual physical impairment of hemiparesis or hemiplegia resulted; (b) who received inpatient services from the Rehabilitation Institute of Chicago prior to July 1, 1962; (c) who were 65 years of age or younger at the time of admission to the Rehabilitation Institute of Chicago inpatient service; and (d) who were able to be located and contacted either by personal interview or questionnaire and were agreeable to interview for study data.

### The Thesis in Perspective

Chapter I, the introduction presents the overall objectives of the Follow-up Study of Hemiplegic Patients. Definitions, the statement of the problem, and the limitations placed on this effort are included in this section.

Chapter II, the literature is reviewed, one section devoted entirely to follow-up studies, and the final section

specifically reviewing research reported on psychological factors in hemiplegia.

Chapter III, the method of sample selection, data collection, and the scoring system are presented with the procedures employed.

Chapter IV, analysis is made of the data with appropriate graphs and tables to aid interpretation.

Chapter V, a summary is made of the obtained results, and conclusions are reached. Recommendations are made for future studies.

## CHAPTER II

### REVIEW OF THE LITERATURE

#### Follow-up Studies

There have been a few follow-up studies reported in the literature. The earliest effort and the only one found to restrict itself to patients with hemiparesis or hemiplegia due to cerebrovascular disease was conducted in New York under a grant from the National Institutes of Health. This was a study of 230 cases with a detailed follow-up of 85 cases discharged from the Physical Medicine and Rehabilitation Service of Bellevue Hospital from January 1, 1947, to June 30, 1956. The report was published as Rehabilitation Monograph XV of the Institute of Physical Medicine and Rehabilitation, New York University-Bellevue Medical Center, 1958 (13). The study was designed to determine how many patients were successful in their rehabilitation and whether or not success or failure was related to age, attitude, time between onset and center admission, and severity of the neurological damage.

Some of the characteristics of the sample are as follows: There were 124 (54%) males and 106 (46%) females in the group of 230 patients discharged from the physical medicine and rehabilitation service during the period of this study. In the special group of 85 patients followed up personally, there were 43 (50.6%) males and 42 (49.4%)

females. The majority of the patients were in the middle age group. The mean age for the 230 patients included in the study was 55.7 years. The marital status of the 230 cases included 12.6% single, 61.3% married, 15.2% widowed, 10.0% divorced or separated, and .9% unknown. Pre-stroke occupations of the patients broke down in the following manner: 4.3% unemployed, 17.0% unskilled, 16.1% semi-skilled, 8.3% skilled, 15.2% white collar, 6.5% professional, 26.5% housewife, 3.0% retired, and 4.3% unknown. There were 126 (54.8%) patients with right-sided paralysis, and 104 (45.2%) with left-sided paralysis.

It should be noted that all hemiplegic patients whose primary disease appeared to be cardiovascular discharged from the physical medicine and rehabilitation service of Bellevue Hospital in New York City during the period of January 1, 1947, to June 30, 1956, were included in this study. However, the patients were screened by staff evaluation prior to their admission to the service. Only those patients who were considered feasible for rehabilitation were admitted. In general, patients were not admitted to the service if they appeared to have marked organic brain damage which precluded their learning the techniques necessary for their rehabilitation; if they had severe cardiovascular disease such as malignant hypertension, angina pectoris with minimal effort, recent myocardial infarction, or intractable congestive heart failure; Or, if their social problems was such that it was unlikely

that they could be discharged from the hospital following completion of rehabilitation training. Therefore, many patients with more severe handicaps were undoubtedly not referred for evaluation because their physicians considered them not suitable. This selection of patients was probably an important factor in determining the results of this study. A probable indication of this effect is the relatively high percentage (38.8%) of hemiplegic patients who were employable after completion of their in-hospital rehabilitation program. In the group of 85 cases followed up personally, 52.9% were employable at the time of hospital discharge and 48.2% were still employable at the time of follow up. The researcher's comment, "The most important single factor appeared to be the motivation of the patients, but because of inadequate data, this is more a clinical impression than a well documented fact" (13).

A two year follow-up study of the patients admitted to the Rehabilitation Center of the hospital of the University of Pennsylvania was reported in the American Journal of Physical Medicine of October 1958 by Dr. Arthur H. Heather (11). Although Dr. Heather's study was concerned with many types of impairments, he did include a sample of 37 hemiplegic patients. Here again the characteristics of the hemiplegic patients were studied, their etiology, employment record, economic status, and the time from onset to hospital admission were reviewed.

Twenty-seven patients were males and ten females. The etiology of the hemiplegia broke down as follows: 28 thrombosis; 4 hemorrhage; 2 embolic; 1 trauma; and 2 tumor. Time in the center varied from two to one hundred and thirty-one days. The average time for the group was thirty-six days. At the time of follow up, 5 of the 37 patients were employed. This included one housewife who was able to care for all of her housework. Of the 37 patients studied, 25 were classified as dependent upon admission. At the time of follow up 16 were listed as dependent. Thus, there was a net loss of 9 in the dependent group. Dependent denoted a patient who could do little or none of his self-care activities. The study reports that when the time spent in the center was compared with the patient's dependency status at the time of admission, discharge, and at follow up, it appeared that unless he had reached an independent status by 60 days, it was unlikely that this goal would be attained. Dr. Heather states, "Also we frequently overlook the pre-illness or pre-accident personality. We cannot expect a poorly motivated individual suddenly to become a dynamic personality after a disabling accident or illness" (11).

A follow-up study of patients discharged from a community rehabilitation center was published by the Hartford Rehabilitation Center in Hartford, Connecticut, in February of 1960 (12). This was a study of 350 discharged patients of the Hartford Rehabilitation Center.

After a review of case records, the discharged patients were divided into two groups; those who had made some improvement in at least one department, and those who had failed to show any improvement at the time of discharge. The improved cases were asked to come into the center for a review by the medical consultant and by the therapist in the departments in which they had received treatment. Efforts were made to obtain a home visit when every patient, whether discharged as improved or not.

Of the 350 cases, 86 or approximately 25% were cerebrovascular accidents. Because the study included 17 different disease categories, little specific information relating to hemiplegia is found.

Unfortunately, less than half of the "improved" hemiplegic cases could be reviewed in the clinic (22 out of 55). Because of this, the figure of 81.8% for "maintained gains" is probably not an accurate reflection of the status of the entire hemiplegic group in this study.

The most significant figure noted was 23.6% of the cerebrovascular accident group died before follow up. This was the highest percentage of deceased cases for any category they studied. The study states, "An analysis of possible motivational factors involved in the findings indicated that a patient's attitude, and, even more important, his responsibility for others may affect his progress after discharge" (12).

Although we were interested in comparable statistics as those reported by the other centers, it became apparent after the first few interviews that there was a need for at least some empirical observations of this motivational element among hemiplegic patients. These observations will be reported and discussed in Chapter V.

#### Research on Psychological Factors in Hemiplegia

Empirical observations made during follow-up visits implied a definite personality change had taken place. Further review of the literature revealed many studies on this aspect of hemiplegia.

Dr. Ullman (18) observed the reactions of 84 patients admitted to a general hospital during the acute phase of a cerebrovascular accident and who experienced hemiparesis or hemiplegia. Patients were classified according to the degree of psychological deficit (mild, moderate, or severe). Those patients who experienced mild strokes with little or no residual mental impairment reacted to stress in their own idiosyncratic manner. In those patients with moderate or severe strokes the situation was quite different. It was assumed that the organ governing adaptation to stress was itself impaired. Therefore, much of what is judged denial in the brain-damaged is such only when interpreted by standards of normal waking behavior.

In a later paper, (20) Dr. Ullman reports his observations of 94 stroke patients. Again, particularly



characteristic of patients with moderate to severe residual motor deficit, is the slow, gradual evolution of a depressive effect, with no denial of the depression. In those who get well enough to leave the hospital, the depression appears to exist parallel with the capacity for day-to-day living. He states the significance of this adaptive failure is that it derives from difficulties that are not psychological, but relate essentially to real inability to reverse or compensate for drastic physical and social changes following the stroke.

Before the Third World Congress of Psychiatry, (19) Dr. Ullman described disturbances associated with hemiplegia and behavioral changes associated with rapid onset of diffuse brain damage.

Dr. Borden (4) implies the psychological impact of a stroke provokes the behavioral change and the disorganizing effects in the patient are exaggerated due to organic brain damage. He reports that the degree of dependence determines the quantity and quality of the psychological impact of the stroke, on both the patient and his family.

Adams and Hurwitz (1) report that in half of the 45 chronic invalids which hemiplegia reassessed following at least six months observation in a hospital, mental barriers accounted for lack of response to rehabilitation efforts to restore activity. Davidson (7) suggests that the emotional reactions of stroke patients vary depending upon the personality of the individual patient. Bardach (3) too

writes that the emotional factors following a stroke influence the behavior of the hemiplegic patient.

Gallaher (10) describes a community effort to treat stroke patients on a group basis. He highly recommends the group therapy approach since it increases motivation among the patients. Diller (8) suggests that an organic patient tends to be less motivated than nonorganic stroke patients and they require as much support, structure, and reassurance as possible.

Psychological studies of Reed (17) indicate that the brain-damaged with right-sided motor deficits demonstrate a different kind of intellectual impairment than observed in persons with left-sided deficits. Differential impairment is attributed to lateralization of cerebral dysfunction. Lorenze (15) suggests that patients who score low in perceptual organization are not likely to acquire independence in dressing even when exposed to intensive rehabilitation.

The literature review contained no reports of studies on extended post hospital treatment of the hemiplegic patient. The potential in this phase of treatment and therefore the potential of the hemiplegic is apparently undetermined.

## CHAPTER III

### METHODOLOGY

#### Design

This thesis uses a descriptive research approach in the study of certain individuals diagnosed as having residual hemiplegia or hemiparesis following the onset of a stroke. A sample was selected and demographic data was gathered on each individual.

Two points in time were selected; the date of discharge from inpatient status at the Rehabilitation Institute of Chicago, and the date of follow-up. The patient's ability to perform each of 12 activities was rated numerically. This rating was made at both points in time. Differences between the sum of the ratings at each point of time were charted for each subject. The distribution was divided into three parts. The parts were labeled improved, static, and regressed, referring to the subject's change in ability to perform the 12 activities.

The demographic characteristics were then studied in relation to these labeled categories to discover relationships which might be of significant predictive value.

Empirical observations were noted and reported, but not statistically recorded.

### The Sample

File Review Cases. The hemiplegics and hemiparetics selected were to be of working age at the onset of their impairment. The sample population was to be composed of patients who had received comprehensive services from the Institute. A determination of improvement or regression was to be made, therefore, a time lapse between receipt of services and the follow-up contact was necessary.

The following criteria for selection of cases were adopted to ensure a sample population with the required characteristics.

1. Patients medically described as having a residual impairment of hemiplegia or hemiparesis.
2. Patients sixty-five years of age or younger at the time of admission.
3. Patients classified as inpatients of the Rehabilitation Institute of Chicago.
4. Patients discharged from inpatient status for a period of two years or more at the time of review.

These criteria were applied to every case in the entire card file of patients who had received services from the Rehabilitation Institute of Chicago. A total of 104 cards were selected as appearing to meet all four selection criteria. Each patient's name and case number was recorded. The resulting list was given to the medical records librarian

who retrieved the 104 files from the medical records library.

The criteria for selection of cases was again applied to the selected medical files. Four files were rejected from the sample as they failed to meet one or more of the delimiting criteria.

The remaining 100 files were studied and record review data collection schedules were completed for each one. These cases comprise the file review sample.

Follow-Up Cases. Case finding activities were begun. Recorded phones and addresses were checked. Relatives and references were contacted when possible. City directories and telephone books were searched. Letters were sent to distant and/or last known addresses with forwarding requests when necessary.

In spite of all follow-up efforts, 36 of the 100 cases could not be located, nor could accurate follow-up information be obtained about them. An additional 18 cases were found to be deceased at follow up. The remaining 46 cases were contacted. A personal interview was conducted in the home of 33 patients and home visit data collection schedules were completed. Questionnaires were completed by 13 patients who lived further than fifty miles from Chicago which was considered a maximum reasonable travel distance.

A detailed follow-up of 46 cases was obtained. These cases comprise the follow-up sample.

### Data Collection Instruments

Three sets of materials were used for three specific data collection phases of the study: (a) for reviewing the Rehabilitation Institute of Chicago Medical Records; (b) for collecting information during the home visit; and (c) for collecting information via mail questionnaire.

Record Review Data Collection Schedules. The record review forms consisted of five schedules: A case identification data sheet, exhibit 1 in appendix; a file review social schedule, exhibit 2 in appendix; a file review impairment schedule, exhibit 3 in appendix; a file review and home visit social schedule, exhibit 4 in appendix; and a file review and home visit physical function schedule, exhibit 5 in appendix.

Home Visit Data Collection Schedules. The personal interview schedules consisted of four forms: A file review and home visit social schedule, exhibit 4 in appendix; a file review and home visit physical function schedule, exhibit 5 in appendix; a home visit vocational schedule, exhibit 6 in appendix; and an interviewer's impression of home visit rating sheet, exhibit 7 in appendix.

Mail Questionnaire Forms. The mail questionnaire required three forms: A letter of explanation from the Rehabilitation Institute of Chicago, exhibit 8 in appendix; a special mail questionnaire, exhibit 9 in appendix; and a stamped return addressed envelope.

All of the forms developed for this study were tested on a pilot sample of six cases and were revised for ease of handling. The forms are set up for IBM key punching, however, the sample was not large enough to warrant placing the gathered information on cards.

### Research Assumptions

Demographic and other data relating to medical impairments, functional capacity, and diagnosis can be empirically inventoried from hospital records.

Factors being measured in this study are significant indices of an individual's functional capacity.

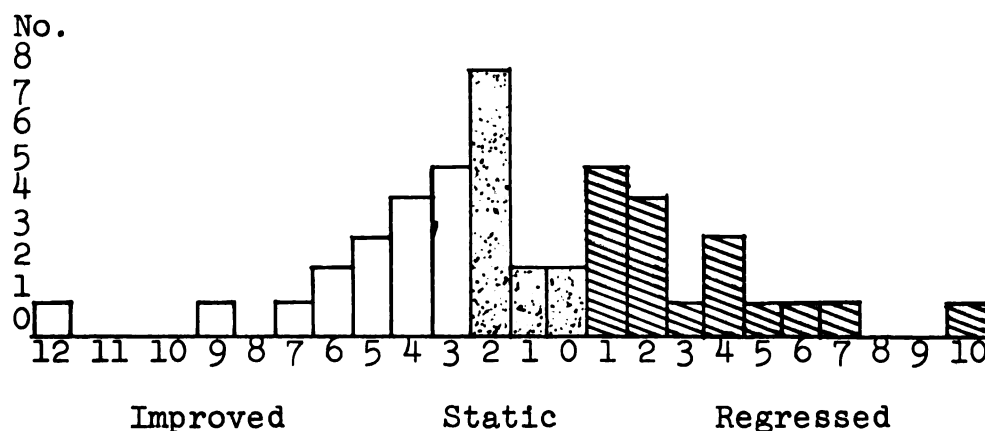
Field interviews utilizing carefully prepared questions and observation can provide data on functional capacity comparable to the data obtained from hospital records.

### Research Procedures

Maintenance of Function Scale. A maintenance of function scale was developed by rating the patient's ability to perform in 12 specific areas; writing, eating, dressing, speaking, walking, stair climbing, personal hygiene, travel, aids, braces, activities, and employment. The patient was rated on a scale of 1 to 3. If the patient was able to function independently, he was given a value of 1 for that task. If he could partially perform the task, but required some assistance, he was given a value of 2. If the patient was completely unable to perform the task, he was given the value of 3. In the case of aids, a cane or none was given a

value of 1, a walker was given a value of 2, and a wheelchair was given a value of 3. Employment full-time, part-time, and unemployed were given values of 1, 2, and 3 respectively. An effort was made to avoid subjectivity on the part of the single person making the ratings by using specific objective units of measure where possible. The questionnaire used to follow-up thirteen cases reflects these specific units of measure. These values were assigned each patient on the basis of information obtained from the file review and indicate the patient's ability to perform the task at the time of his discharge from the Institute. Each patient was again evaluated in these 12 areas at follow-up and a similar rating was assigned on the basis of ability to perform the 12 tasks. This made it possible to sum the point value of all the activities that the patient could perform at the time of discharge from the Institute, then separately sum the point values assigned for the patient's ability to perform these same tasks at follow-up. By comparing sums a plus or minus point value difference between the patient's ability to function at discharge and at follow-up was obtained. Exhibit 10 in the appendix shows a sample tally sheet. The following graph shows a distribution of the 46 cases studied. It also shows the division of the distribution into improved, static, and regressed groups to accomplish the purposes of the study.





Graph 1. -- Distribution of Point of Value changes.

For labeling purposes the high 17 cases in terms of point value increase were considered to have improved in physical function since discharge from the Institute. The lower 17 cases who decreased in point of value were considered to have regressed since discharge from the Institute. The middle 12 cases were considered to be static since discharge from the Institute. Having made these assignments to the 46 cases followed up it was then possible to study the results in terms of these classifications.

Chi-Square Test. A Chi-Square test for multiclass sample of multiclass populations was applied to certain tables to test the null hypotheses for an equal division of hypothesized frequencies among the several categories. The following tables were selected:

Table 6. -- Sibling orientation related to maintenance of function.

Table 7. -- Education related to maintenance of function.

Table 10. -- Time lapse from onset to admission  
related to maintenance of function.

Significance was determined at one degree of freedom.

Chi-Square Tables are found in exhibit 11 of the  
appendix.

Limitation. The uncontrolled variables in the pre-  
sentation of questions during an interview and via a  
questionnaire are possible limitations of the data gathering  
procedure.

## CHAPTER IV

### ANALYSIS OF THE DATA

#### Introduction

The characteristics of the 100 patients with hemiparesis or hemiplegia described in this study include: source of referral, description of impairment, age, sex, education, occupation, marital status, sibling orientation, time factors, and activities. It was possible to locate 64 of the 100 cases. Of the 64 cases, 18 or 28% were deceased. This is slightly higher than the 23.6% reported in the Hartford Study (12). Study data was obtained on the remaining 46 cases. The characteristics of these 46 cases will be discussed both in terms of their group characteristics and in terms of the characteristics of these cases determined to have improved since their discharge from the Institute, those cases who have remained static, and those cases who have regressed. This description will include; elapsed time between discharge and follow up, marital status, education, source of support, occupation, lapse of time between onset and time of admission, length of hospitalization, type of services received, activity on the part of the patient at home and assistive devices used at discharge and at follow up.

The empirical observations made during follow-up interviews will be reported at the end of the chapter. Such topics as personality, social life pattern, spouse

and/or family preparation are discussed along with a suggestion for a "force assistance" functional management program.

### Analysis of Results

Table 1. -- Referral sources of sample cases.

Source	All Cases	46 Cases
Physician	53	26
Welfare	30	13
Rehabilitation	13	5
Hospital	2	2
Insurance	2	0
Totals	100	46

Table 1 would seem to indicate that insurance companies did not use, at least at that time, rehabilitation center facilities extensively for stroke patients. It should be noted, however, that a number of the cases referred by sources other than insurance companies were actually sponsored by insurance companies. Over the years there has been a more general acceptance of Rehabilitation Institute type services on the part of insurance carriers. More recent information from the Institute suggests that a current study would reflect a higher referral rate from insurance company sources. The above table reflects the referral rate at the early stages of the center operation. Insurance companies

as a rule tend to take a wait-and-see attitude towards new hospital services. The Institute services have been proven and the insurance companies have discovered that the severity of disability is often reduced as the result of such services and consequently the liability on the part of the insurance company is reduced.

The frequency distribution also shows that the sample group of 46 cases is representative of the total population of 100 considering source of referral.

About 70 percent of the speech problems reported appear in connection with brain damage on the left side. In those cases where there is "left brain" involvement, 87 percent presents speech problems. In those cases where there is right brain involvement, 38 percent presents speech problems. The nature of the speech problem was not identified in the data collection process, therefore assumptions cannot be made regarding the nature of the speech problem in relation to the sight of the lesion.

It should be noted that Table 2 reflects the location of the lesion in the brain and not the side suffering from paralysis. For example, the 44 cases shown as having a CVA on the right side all suffered a left hemiplegia. In this table the same refers to the invalidism, trauma, and tumor qualifications.

The University of Pennsylvania study (11) reported that 28 of their 37 hemiplegic cases were secondary to thrombosis and 4 were secondary to hemorrhage. The

Table 2. -- Etiology of hemiplegia and frequency of related problems of speech and incontinence.

Cause	Total	46 Cases	Speech Problems	46 Cases	Incontinence	46 Cases
C. V. A. Right	45	20	19	7	5	0
C. V. A. Left	40	19	33	17	8	2
C. V. A. Bilateral	1	1	1	1	1	1
Embolism Right	3	1	0	0	0	0
Embolism Left	5	3	5	3	0	0
Trauma Right	4	1	1	0	0	0
Trauma Left	2	1	2	1	1	0
Totals	100	46	61	29	15	3

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table gives rise to some question as to the meaning of CVA on the medical report when the doctor is stating the etiology of the hemiplegic condition. It seems unlikely that there would be such an extreme variation between the two studies by chance.

Table 3. -- Distribution of population by sex and age at onset.

Age	Total	Male	Female
20-35	13	10	3
36-45	20	6	14
46-55	27	15	12
56-65	40	24	16
Totals	100	55	45

Table 3 clearly shows the incidence of cerebrovascular disorders resulting in hemiplegia increasing directly with age. Because the study was limited to individuals 65 and under, the table goes no higher. However, one would expect this progression to continue. Between 36 and 45 years of age, the female hemiplegic out-numbers the male two to one. Between the ages of 56 and 65 years of age, the male hemiplegic out-numbers the female three to two. The 55 men to 45 women ratio in this study closely coincides with the 54 percent males and 46 percent females reported in the Bellevue Medical Center Study of 1958 (13).



Table 4. -- Distribution of follow-up cases by sex and age at onset and in relation to maintenance of function.

Age	Total			Male			Female		
	Total Improved	Static Regressed	Total Improved	Static Regressed	Total Improved	Static Regressed	Total Improved	Static Regressed	Total Improved
20-35	2	1	1	0	1	0	1	1	0
36-45	8	3	1	4	3	0	5	3	0
46-55	12	6	4	2	8	3	4	3	1
56-65	24	7	6	11	14	4	10	3	2
Totals	46	17	12	17	26	7	20	10	3
									7

A study of Table 4 seems to indicate that the young female hemiplegic has more success in maintaining function after leaving the Institute than does the male. The male "improve-and-regress-ratio" is about the same regardless of age. This difference may be related to the ease with which families return the responsibilities of homemaking to the female hemiplegic. When she returns home, she returns to her work station which enhances the gradual resumption of her work activities in the home. She is able to begin by dusting and then as she feels better; can do dishes, gradually assume the ironing responsibilities, and some sewing, until she is finally doing the laundry and heavier housekeeping chores. The fact that her convalescence is taking place within her work environment keeps constantly before her the need for her services which stimulates the necessary motivation to recover.

The male hemiplegic, on the other hand, does not have accessibility to his work environment as a general rule. Employers do not encourage nor do they desire to have marginal employees in a profit motivated organization. They are interested primarily in having the patient return to work only when he is capable of assuming full responsibility for some phase of the work. Therefore, it is more difficult for the male hemiplegic to feel that he is needed and that he still has a contribution to make in the world of work. This is one of the observations supporting the recommendation made in the final chapter of this study;

that a programmed plan be developed for the reintegration of the hemiplegic back into his usual role in society.

Lapse of Time Between Discharge and Follow Up. Fifteen of the 46 cases had been discharged for a period of two to three years. An additional fifteen had been discharged for a period of three to four years. Twelve had been discharged for a period of four to five years, two a period of five to six years, and two a period of six to seven years. Two-thirds of the follow-up sample, therefore, had been discharged from the Institute for a period of two to four years.

Table 5. -- Marital status in relation to maintenance of function.

Status	Total	Improved	Static	Regressed
Single	5	1	3	1
Married	31	12	7	12
Separated	4	2	0	2
Widowed	3	2	0	1
Divorced	3	0	2	1
Totals	46	17	12	17

Table 5 could lead one to naively entertain the hypothesis that there is some relationship between marriage and a cerebrovascular disorder. Maintenance of function apparently is unaffected by the marital status of the patient

when one considers only the statistical evidence of marriage. This does not support the hunch expressed in the Hartford study (12) that responsibility for others may affect a patient's progress after discharge. However, no related factors are considered and such things as compatibility, family harmony, etc., may exercise considerable influence.

Table 6. -- Sibling orientation related to maintenance of function.

Number of Children	Total	Improved	Static	Regressed
Only child	10	3	1	6
1 of 2	9	4	4	1
1 of 3	3	1	1	1
1 of 4	7	2	1	4
1 of 5 or more	17	7	5	5
Totals	46	17	12	17

It seemed "reasonable" to expect that a patient coming from a large family would be more likely to persevere in seeking independence because of the necessity of having to fend for himself during childhood more than would be required of an only child. The results in Table 6 indicates a slightly skewed distribution which would support such a hypothesis, but not statistically significant enough to say that patients with siblings do better than an only child in terms of maintaining physical function after

discharge. A Chi-Square test did not reject a hypothesis of equal occurrence across the maintenance of function scales at a significant level, exhibit 11 in appendix.

Table 7. -- Education related to maintenance of function.

Years	Total	46 Cases	Improved	Static	Regressed
0 - 4	8	2	0	1	1
5 - 8	29	16	6	3	7
9 -12	47	19	8	7	4
13-16	12	6	2	1	3
17-20	4	3	1	0	2
Totals	100	46	17	12	17

Table 7 reflects a normal distribution of educational achievement for the total group. Other than a slight tendency for high school level patients to do better in improving their physical function since discharge from the Institute, there does not seem to be any significant relationship between educational achievement and maintenance of physical function after discharge. This does not support the hunch that achievement to levels of education prepares one for dealing more effectively with a severe physical impairment. It fails to support Dr. Heather's thesis (11) that the pre-morbid educational level is a substantial factor in determining improvement. It should be noted that the

more affluent patients continued treatment after discharge. There was no observable benefits derived from this extra expenditure of funds.

Table 8. -- Primary source of support before onset and at follow-up.

Source	Before Onset	At Follow-up
Employment	33	3
Spouse	7	7
Children	0	2
Parents	1	0
Investments	0	5
Pension (OASI)	1	22
Public Assistance	4	7
Totals	46	46

Table 8 indicates that only three of the 46 cases followed up were found to be working. This is considerably lower than the 48.2 percent reported in the Bellevue Study (13). However, it should be noted that the Bellevue Study screened the patients prior to their admission to the services. Only those patients who were considered feasible for substantial rehabilitation improvement were admitted. Therefore, many patients with severe or complicating impairments were not referred for evaluation and were not included in the study. Such was not the case in this study. All of the inpatient



hemiplegic cases were considered and comprised the total population including those with severe and complicating organic brain damage and other secondary impairments.

Another factor is the existence of disability insurance benefits under the Old Age and Survivors Insurance (OASI) program. A considerable number of formerly employed patients started drawing this type of pension after the onset of their disability as can be seen in Table 8.

Table 9. -- Occupations related to maintenance of function.

Occupation	Total	Improved	Static	Regressed
Professional and Managerial	12	5	2	5
Clerical and Sales	4	0	4	0
Service Occupations	12	5	2	5
Agricultural	0	0	0	0
Skilled Occupations	5	1	2	2
Semiskilled Occupations	4	0	1	3
Unskilled Occupations	0	0	0	0
Homemaker	9	6	1	2
Totals	46	17	12	17



One might expect, as did Dr. Heather (11), that persons engaging in professional and managerial occupations such as store owners, pharmacy, contracting, law and the other professions would be better equipped to cope with disability and manage their rehabilitation process more effectively. However, Table 9 indicates there is no difference between the maintenance of physical function of the professional and managerial workers and those patients engaged in service occupations such as domestics, janitors, and gas station attendants. The results do indicate that being a homemaker might enhance ones chances of improving ones physical function after discharge. An explanation for this related to the availability of the work station is discussed under Table 4. It is interesting to note that there were no patients engaging in agricultural occupations or in occupations classified as unskilled in this sampling.

Table 10. -- Time lapse from onset to admission related to maintenance of function.

Months	Total	Improved	Static	Regressed
1 to 3	15	10	2	3
3 to 6	7	3	2	2
Over 6	24	4	8	12
Totals	46	17	12	17

It should be noted that 60 percent of the improved cases were admitted to the Institute within three months after onset. A Chi-Square test was run on the "1 to 3 month" group assuming an hypothesis of equal occurrence of improved, static, and regressed cases. A Chi-Square value of 7.6 was obtained. With one degree of freedom, the one and five percent levels of significance are 6.6 and 3.8 respectively. A similar test run on the "over 6 months" group resulted in a Chi-Square value of 4.0, which was significant at the five percent level, exhibit 11 in appendix. This further substantiates the fact that early inauguration of a functional management program correlates with a greater return of physical function. One would expect to see the distribution skewed toward early admission after onset. The benefits that might accrue to long time chronic patients is interesting. One of these cases was admitted to the Institute sixteen years after onset and still received some measurable benefit from the services provided.

One of the problems in a rehabilitation center is being able to identify when a point of diminishing returns has been reached by the patient. Institute services are expensive and it is "unfair" to the individual and the agency underwriting the cost to continue the patient beyond the point where benefits are not forthcoming from services being rendered. By plotting the length of hospitalization against maintenance of function ratings, perhaps a time pattern will appear.

Table 11. -- Length of hospitalization related to maintenance of function.

Weeks	Total	Improved	Static	Regressed
Less than 2 weeks	9	3	2	4
2 to 4 weeks	11	6	2	3
4 to 6 weeks	6	1	3	2
6 to 8 weeks	4	2	0	2
8 to 10 weeks	3	2	1	0
Over 10 weeks	13	3	4	6
Totals	46	17	12	17

The results of such plotting in Table 11 indicate that 50 percent of the improved cases spent less than four weeks at the Institute. One should not ignore the fact that 13 cases stayed 10 weeks or more with one case being hospitalized for a period of seven months. About 25 percent of these long-stay-cases were able to improve their physical function after discharge. However, these improved cases might have been improved cases at the end of four weeks but still showed potential for improvement. Four to six weeks is the typical length of stay in the studies of the hemiplegic reviewed here. If early services were sold in a six week evaluation package, insurance companies might show more interest in evaluating the potential of hemiplegics for self care at a rehabilitation center.

A study of services rendered to each group might have supported a hunch that a higher intensity of service correlates with better post hospital performance. Table 12 shows only the density of service for each group which tends to support the hunch, but not to a significant degree. Intensity could not be measured.

Table 12. -- Frequency of services rendered in relation to maintenance of function.

Service	Total	Improved	Static	Regressed
Assistive Devices	22	10	5	7
Exercise	41	15	12	14
Ambulation Training	37	14	10	13
Speech Therapy	24	7	7	10
ADL Training	37	13	10	14
Social Service	33	13	9	11
Psychological Service	22	10	6	6
Prevocational Service	12	2	4	6
Totals	228	84	63	81

The most frequent services received regardless of maintenance of function ability were exercise, ambulation training, and activities of daily living training. These were closely followed by social service. Specificity of

these services did not differentiate between the functional capacity of the patient after discharge. The type of service provided may be related to the initial severity of the disability and hence may not be considered as a constant variable. Assistive devices and psychological services would seem to be closely related to maintenance of function. Being shown how to cope with ones environment in spite of severe physical limitations and learning to live a productive life with these conditions would seem to be among the basic elements for sound rehabilitation. Table 12 does not give any predictive clues for improvement.

Table 13. -- Patient social activity in the Institute related to maintenance of function.

Degree of Activity	Total	Improved	Static	Regressed
Inactive	17	5	6	6
Active in Room	5	3	1	1
Active in Both Room and on Ward	24	9	5	10
Totals	46	17	12	17

Patient socializing activity was measured by making a judgement based on the nursing notes in the medical file. Consequently, it must be recognized that the socially inactive patient may have been worse off initially on a physical basis with complicating medical problems or the socially inactive patient may have been socially active

1

in the treatment areas and fatigued upon returning to the nursing floor. Keeping these limitations in mind, it would seem reasonable to expect that a patient who is socially active in the room and on the ward might do better in maintaining function gains after discharge. Table 13 indicates that there is no significant difference between a socially inactive patient and a socially active patient in terms of predicting which patients will maintain or improve their physical function after discharge. Social activity on the "nursing floor" does not appear to be a reliable predictor of future patient improvement. It should be noted, however, that further qualifications might result in a more accurate definition and classification of patient activities.

Table 14. -- Patient activity at follow-up related to maintenance of function.

Degree of Activity	Total	Improved	Static	Regressed
Inactive	13	2	3	8
Active in Home	11	3	2	6
Active Both Inside and Outside Home	22	12	7	3
Totals	46	17	12	17

The distribution of figures in Table 14 reflects the method of evaluating improvement and regression. The cases

Table 15. -- Aids used at discharge and at follow-up related to maintenance of function.

Aids	At Discharge			At Follow-up		
	Total Improved	Static Regressed	Total Improved	Static Regressed	Total Improved	Static Regressed
Wheelchair	7	3	1	3	3	0
Walker	30	13	6	11	4	2
Cane or no assistance	9	1	5	3	39	10
Totals	46	17	12	17	46	12
					17	17



identified as showing improvement are active both inside and outside the home. Cases identified as showing regression are inactive. By the very nature of the study's definition, improvement varies directly with the amount of activity inside and outside the home, whereas regression varies indirectly with increased activity.

The statistics show that 60 percent of the sample population was able to go from a walker to a cane after discharge. Table 15 indicates that improvement in each area of classification is reflected in the general reduction in the use of the wheelchair and the walker and the increase in the use of the cane or no assistive device at all. It is apparent that ambulation is one of the greatest benefits that results from intensive rehabilitation center service to hemiplegics.

Attitudes of Patients. An attempt to measure and record incidents of cooperative behavior versus incidents of uncooperative behavior was made. However, there were so many judgmental variables involved in so many treatment areas that it was thought best to eliminate this global evaluation.

Statistical Results. A Chi-Square test for multiclass sample of multiclass populations was applied to certain tables to test the null hypothesis for equal division of hypothesized frequencies among the several categories. Selection of tables was on the basis of inspection for



wide frequency variations. Tables 6, 7, and 10 were chosen. Only Table 10, however, yielded a Chi-Square value which was significant at the one percent level with one degree of freedom. There is a statistically significant relationship, therefore, between early hospitalization after onset and maintenance of function after discharge.

Generally speaking, the limited size of the sample in this study did not lend itself to meaningful statistical analysis. Chi-Square Tables are found in exhibit 11 in appendix.

### Observations

The most striking fact in conducting this study was not the statistical data per se, but the observed type of personality change that was evident in 90 percent of the cases visited. People who had been dynamic individuals prior to the onset of the disability were now facing the world with a lethargic indifference. A successful builder was content to meet with the "boys" once a week for his entire week's entertainment. A successful heating contractor goes to the gym two days each week and this is his entire activity for that period.

This attitude was not restricted to certain occupational categories as the same "personality change" was manifested in the domestic workers and the janitors. Less than 10 percent of the individuals had hobbies to keep them busy and few of them did little more than watch T.V. and do a little dusting around the house. The similarity

of these personality characteristics in most of the patients suggests that there may be an organic base for the change.

One might also hypothesize that the "dynamic, driving person" welcomed a kind of conversion reaction which made inactivity acceptable and the "welfare recipient" now had a socially acceptable reason for his continued inactivity. However, it is suspect that a group of more than 40 separate individuals would develop such a "uniform personality" with so many similar characteristics unless it was a typical manifestation of an organic impairment. Such evidence indicates the organic components of personality change need further investigation.

The family and/or spouse was often content to accept this new personality as it made it easy to care for the patient. One woman viewed it as a blessing.

The social life structure of these families were vastly altered as the patient returned home. Old friends disappeared and a new group of social relationships developed. Usually the social activity was sharply reduced. This presented a difficult adaptation problem to the family members as their needs had not changed, only the heavy demands being made on them were new. However, old ways of leisure were usually no longer available. (e. g., attending the theatre can no longer be a last-minute decision, it is now a planned excursion.)

It was impossible not to notice a lack of, or a need for continued support on the part of the spouse or family

to cope with the personality change, the personal needs and the changed social life structure.

This gives rise to the question of who has the responsibility for the continued follow-up support that a family and patient need. The family or spouse must be prepared to assume the job of meeting the nursing needs, adapting to the changed social structure and the new social relationships that develop, and learning to allow the patient to conduct his own activities, and even "force assist" him to carry them out when it is much easier to do it yourself.

Although this training is made available in the Institute and is provided in the patient's home, it should be a service offered on a continuing basis. Periodic contact with the Institute has value for maintaining functional gains. Insurance companies, family physicians, and other referral sources would do well to foster such periodic reviews of the patient's status. Post-discharge home care is an area still needing considerable exploration.

It is important to re-educate the person in the function of their habitual occupation or a reasonable substitute in keeping with the persons functional and intellectual abilities at the time, in order to permit their return home and to a certain independence if possible. It is equally important to follow them up once they have returned to their home, and to bring them into contact with groups of patients with the same impairment. Personal experience in military hospitals where groups of amputees



were collected together in a single hospital for intensive treatment revealed that a psychological benefit to the patient was derived that was not a part of the medical program. The association of individuals with similar impairments did much to develop an acceptance of limitations on the part of patients. Perhaps "group work" with hemiplegics might bring about such an objective approach to their problems through mutual discussion and consideration of particular cases among them. Personal interaction could have the result of making their own situation less formidable and easier to cope with. It would be expected that as the patient became more accustomed to living with his residual impairments he would become less active in such a group and more involved with his own life situation.

One woman would not permit inactivity on the part of her spouse. She insisted he get out daily if it was no more than sitting in the lobby of their apartment hotel and passing the time of day with other residents. He went to ball games, political meetings, civic functions, dinners, and continued to socialize with their circle of friends. He enrolled in an art course that met daily and his art activities were encouraged to the point where he became a prolific painter producing approximately two dozen oil paintings in the period of two years since his discharge from the Institute. During this two year period, his attention span had gradually increased to the point where he could play a game of checkers and even a game of chess.

He was able to go to, sit through, and follow the action of a ball game for the entire nine innings. During the latter months before contact, he was beginning to obtain more and more control of his urinary incontinence so that he could go for progressively longer periods of time without special equipment. On the basis of observing this patient and other patients followed up in the study it would seem apparent that there is some need for further research in family factors affecting the hemiplegic's return to an active social life.

Recognizing that motivation in an individual is a psychological phenomenon which takes place in a social environment and that the social factors which exert a favorable influence on one individual may have little affect on another because of differences in background, age, sex, occupation, family status, economic status, education, ethnic origin, location, religion, and attitudes, it would seem that investigation into such factors appears high of the priority list of needed research with hemiplegic patients.



## CHAPTER V

### SUMMARY, CONCLUSIONS, AND IMPLICATIONS FOR FURTHER RESEARCH

#### Summary

The Problem. It was the purpose of this study to assess the demographic, functional, active, and economic characteristics of certain hemiplegic patients of the Rehabilitation Institute of Chicago at two points in time and note any changes that occurred in these characteristics. The patients were grouped into improved, static, and regressed categories. These categories were examined to discover any special or significant characteristics that were peculiar to any one of the groups and that might explain or predict the degree of functional return that can be expected in similar cases.

The Sample. The total sample consisted of 100 hemiplegic individuals who had been inpatients of the Rehabilitation Institute of Chicago, who were 65 years of age or younger at the date of admission, and who had been discharged for a period of two years or more.

The follow-up sample consisted of 46 of the total sample cases who could be located, were living, and would provide detailed follow-up information.

Methodology. Two points in time were selected; the date of discharge from inpatient status at the Rehabilitation Institute, and the date of follow-up contact. The patient's ability to perform or his status in each of twelve areas was

rated numerically. This rating was made at both points in time. Differences between the sum of the ratings at each point in time were charted for each subject. The distribution was divided into three parts. The parts were labeled improved, static, and regressed, referring to the patient's change in ability to perform or his status in the twelve areas.

The demographic characteristics were then studied in relation to these labeled categories to discover any relationships which might be of significant predictive value. Also, empirical observations were noted and reported.

Review of Findings. An analysis was conducted using the 100 hemiplegic patients 65 years of age or younger who received inpatient services from the Rehabilitation Institute of Chicago prior to July 1, 1962. Particular emphasis was placed on the characteristics of the patient on admission, their status on discharge, at follow-up, and factors affecting their rehabilitation.

The family physician was the most common referral source, referring better than 50 percent of the cases studied. Welfare was the next best source referring 30 percent of the cases. The third most frequent referral source was the Division of Vocational Rehabilitation who referred approximately 13 percent of the cases.

On admission, there were 55 percent males and 45 percent females with a median age of 52 years for the total sample. The majority (67 percent) of the 46 study cases followed up

were married. Thirty-seven percent of the total population had less than a 9th grade education. Sixteen percent had some college with four percent having attended graduate school. In general the educational status of the patients was superior to that of the general population. Of the 46 cases studied on follow-up, 70 percent were employed prior to the onset of their impairment whereas only seven percent were employed at the time of follow-up.

The interval from the onset of illness to admission to the Institute for rehabilitation services varied from less than one month to sixteen years in one case. Of the 46 cases that were contacted on follow-up, 17 were classified as improved since their discharge from the Institute. Sixty percent of these improved cases were admitted to the Institute within three months after onset. It should be noted that there is a high relationship between early inauguration of a functional management program with a high return of physical function. The length of hospitalization varied from less than one week to seven months. The median length of stay, however, was from four to five weeks.

Ambulation at the time of discharge in the 46 cases studied in the sample was still a problem. Thirty patients were still using a walker and seven were using a wheelchair. On follow-up, only four were using a walker and three were using a wheelchair. The study shows, therefore, that 60 percent had improved in ambulation at the time of follow-up. This compares favorably with the Bellevue study (13) which

10-1-10

shows 63.5 percent had improved in ambulation. The results of the tabulated information in this study correspond generally with the findings of previous studies of hemiplegic cases. It is reasonable to assume on the basis of these findings that this study was made on a reasonably representative sample of this disability group.

One of the most significant differences is the fact that only three of the 46 cases were working at the time of follow-up. One was self-employed as a tavern owner, one was a traffic manager for a large company, and one was managing an apartment house. One other case had been employed after leaving the Institute, but retired before a follow-up contact was made. This represents less than 10 percent of this population that was employed at the time of follow-up.

The factors in this study which appeared to directly affect the achievement of patients and their rehabilitation include age, marital status, occupation, severity of the residual impairment, and time lapse from the original stroke until admission to the Institute for rehabilitation services. The most important single factor consequent to becoming a hemiplegic patient appeared to be the "personality change" which followed the onset of the disability. This "personality change" made the job of stimulating motivation in the patient difficult. Factors which were found in the study to have little or no significant affect on the results obtained in rehabilitation were; sex, education, occupation, and the miscellaneous physical characteristics of the patients.

Late in the study it was discovered that proper notation of the nature and extent of the speech problem was not made on the study's evaluation instruments. In most of the studies done in the past there has been little attention given to the specific diagnosis of speech problems and their progress through treatment and status at follow-up. This information would be extremely helpful in determining the importance of this impairment in effecting the rehabilitation of the hemiplegic patient. Although speech problems were noted, the specific nature of the speech problem was not identified and therefore generalizations or implications cannot be stated.

### Conclusions

1. Rehabilitation agencies offering services to hemiplegic patients must continue to be concerned with the spouse or parents of the patient and assume responsibility for preparing them to cope with the changed personality structure and relationships that will be forthcoming as well as the responsibilities for patient care. Such preparation should include follow-up visits to the patient's home for discussion of problems in the setting where they occur.

2. Early inauguration of a function management program enhances a greater return of physical function.

3. The probability of a cerebrovascular accident increases directly with age.

4. The female hemiplegic under age 55 has the best chance of maintaining physical function after discharge



from the Institute.

5. The most frequent benefit from Rehabilitation Institute services to hemiplegic patients is the ability to ambulate.

6. Demographic characteristics of hemiplegic patients have little apparent influence on their ability to maintain physical function after discharge.

7. The "true" vocational potential of a hemiplegic patient cannot be determined until post-discharge services are designed, implimented, and evaluated over a period of time.

#### Implications for Further Research

Much is yet undone in the area of research for the stroke or hemiplegic patient. The following implications for further research were apparent in this study:

1. It is strongly indicated that further research be done on family factors affecting the hemiplegic's return to an active social life. The empirical evidence indicates that untapped potential for functional return is available if a programmed plan is instituted to assist the individual in assuming a realistic role in society.

2. A comparative study of left and right hemiplegic patients might form a foundation for basic research into the etiology and differential effect of such lesions in the central nervous system.

3. A demonstration study on the effectiveness of "group work" techniques on hemiplegic patients recently



discharged from a hospital or rehabilitation center might show surprising results.

4. There is need to definitely explore the nature of the apparent "personality change" that takes place as a result of cerebrovascular accident. The patterns and the personality traits were so similar among the subjects studied as to lead one to consider that it may be organic in nature. This change seemed to be directly related to a reduction of motivation. This reduction in motivation is also directly related to rehabilitation as "motivation to recover" is commonly regarded as the single most important factor in the success or failure of services rendered to hemiplegic patients. A group of hemiplegic patients could be followed up with a programmed plan for re-integration into society that required their active participation.

There is reason to believe that the findings of such a study would cause state and local agencies to reassess the possibility of evaluating their hemiplegic clientele for vocational potential. Findings imply that this disability group could prove to be a more fruitful source of rehabilitated clients than presently considered.

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## APPENDICES

## EXHIBIT I

## CASE IDENTIFICATION SHEET

CODE \_\_\_\_\_

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

PHONE \_\_\_\_\_

SPOUSE, PARENT OR GUARDIAN'S NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

PHONE \_\_\_\_\_

## TYPE OF CASE

1 \_\_\_\_\_ ACCEPTED AND SCHEDULES COMPLETED

2 \_\_\_\_\_ ACCEPTED BUT SCHEDULES NOT COMPLETED

3 \_\_\_\_\_ NOT ACCEPTED

IF 2 OR 3, WHY? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## EXHIBIT 2

## FILE REVIEW SCHEDULE - SOCIAL

Code _____	(1,2,3)	Card 1
<b>REFERRAL SOURCE (4)</b>		
X _____ Interested Individual		<b>SUBJECTS AGE AT TIME OF INITIAL DEPARTURE FROM FAMILY OF ORIENTATION (14)</b>
Y _____ Federal Employee		0 _____ Never Departed
0 _____ Physician		1 _____ Under 15 Years of Age
1 _____ Hospital		2 _____ Between 15 and 19
2 _____ V. R. Agency		3 _____ Between 20 and 24
3 _____ I. P. A. C.		4 _____ Between 25 and 29
4 _____ C. C. W. D.		5 _____ 30 Years or Over
5 _____ Health Department		
6 _____ Private Agency		<b>REASON FOR LEAVING (15)</b>
7 _____ Workman's Compensation		0 _____ Not Applicable
8 _____ Insurance Company		1 _____ To Get Married
9 _____ Other (Spec.) _____		2 _____ To Attend School
		3 _____ Just to Live Independently
<b>SEX (5)</b>		4 _____ To Go Into Service
1 _____ Male		5 _____ Other (Spec.) _____
2 _____ Female		
<b>DATES (6,7)</b>		<b>SUBJECT'S ATTITUDE TOWARD PARENTS AT INITIAL DEPARTURE (16)</b>
Admission _____		0 _____ Favorable
Discharge _____		1 _____ Unfavorable
Months Hospitalized _____		2 _____ Indifferent
		3 _____ Other (Spec.) _____
<b>NUMBER OF SIBLINGS (8,9)</b>		
Brothers _____		<b>COOPERATIVENESS IN HOSPITAL AT ADMISSION (17)</b>
Sisters _____		1 _____ Cooperative
		2 _____ Indifferent
<b>SUBJECT'S WORKING STATUS AT TIME OF ONSET OF DISABILITY (10)</b>		3 _____ Uncooperative
1 _____ Not Working		<b>DURING TREATMENT (18)</b>
2 _____ Working Part-time		1 _____ Cooperative
3 _____ Working Full-time		2 _____ Indifferent
4 _____ Student		3 _____ Uncooperative
5 _____ Other (Spec.) _____		
<b>IF WORKING AT ONSET (11,12,13)</b>		<b>AT DISCHARGE (19)</b>
Occupation _____		1 _____ Cooperative
D. O. T. Code _____		2 _____ Indifferent
		3 _____ Uncooperative

## EXHIBIT 3

## FILE REVIEW SCHEDULE - IMPAIRMENT

## PRIMARY DISORDER

Card 1

DIAGNOSIS \_\_\_\_\_ (20,21,22) Code \_\_\_\_\_

ETIOLOGY \_\_\_\_\_ (23,24,25) Code \_\_\_\_\_

## SECONDARY DISORDERS

FUNCTIONAL INVOLVEMENT OF  
EXTREMITIES

(26)

- 0 \_\_\_\_\_ Fracture  
 1 \_\_\_\_\_ Monoplegia  
 2 \_\_\_\_\_ Diplegia  
 3 \_\_\_\_\_ Triplegia  
 4 \_\_\_\_\_ Quadriplegia  
 5 \_\_\_\_\_ Hemiplegia  
 6 \_\_\_\_\_ Paraplegia  
 7 \_\_\_\_\_ Shortening of Extremity  
 8 \_\_\_\_\_ Amputee  
 9 \_\_\_\_\_ Other (Spec.) \_\_\_\_\_

AGE AT ONSET \_\_\_\_\_ YEARS (31,32)

LAPSE OF TIME BETWEEN ONSET AND  
ADMISSION \_\_\_\_\_ YRS \_\_\_\_\_ MOS (33,34)

## MEDICAL OBJECTIVE

- 1 \_\_\_\_\_ Full Activity  
 2 \_\_\_\_\_ Slightly Limited Activity  
 3 \_\_\_\_\_ Markedly Limited Activity  
 4 \_\_\_\_\_ Self Care Only  
 5 \_\_\_\_\_ No Improvement  
 6 \_\_\_\_\_ Other (Spec.) \_\_\_\_\_

## INCONTINENCE

(27) REMEDIAL TREATMENT

(36)

- 1 \_\_\_\_\_ Bladder  
 2 \_\_\_\_\_ Fecal  
 3 \_\_\_\_\_ Both  
 4 \_\_\_\_\_ Irregular

- X \_\_\_\_\_ Nursing  
 Y \_\_\_\_\_ Medication  
 0 \_\_\_\_\_ Surgery  
 1 \_\_\_\_\_ Assistive Devices  
 2 \_\_\_\_\_ Exercise  
 3 \_\_\_\_\_ Ambulation Training  
 4 \_\_\_\_\_ Speech Therapy  
 5 \_\_\_\_\_ A. D. L. Training  
 6 \_\_\_\_\_ Social Service

## SPEECH IMPAIRMENT

(28)

- 1 \_\_\_\_\_ Functional  
 2 \_\_\_\_\_ Organic

- 7 \_\_\_\_\_ Psychological Services  
 8 \_\_\_\_\_ Pre-vocational Services  
 9 \_\_\_\_\_ Other (Spec.) \_\_\_\_\_

## HEARING IMPAIRMENT

(29)

- 1 \_\_\_\_\_ Partial Hearing  
 2 \_\_\_\_\_ Deaf  
 3 \_\_\_\_\_ Other (Spec.) \_\_\_\_\_

## HEALTH PROBLEMS IN FAMILY OF ORIENTATION

## VISUAL IMPAIRMENT

(30)

CHRONIC PERIODIC SELDOM NA  
ILLNESS ILLNESS ILL

- 1 \_\_\_\_\_ One Partial  
 2 \_\_\_\_\_ Both Partial  
 3 \_\_\_\_\_ One Blind  
 4 \_\_\_\_\_ Legally Blind  
 5 \_\_\_\_\_ Totally Blind  
 6 \_\_\_\_\_ Other (Spec.) \_\_\_\_\_

Mother	(37)0 _____	1 _____	2 _____	3 _____
Father	(38)0 _____	1 _____	2 _____	3 _____
Sister(s)	(39)0 _____	1 _____	2 _____	3 _____
Brother(s)	(40)0 _____	1 _____	2 _____	3 _____
Comments	_____			



## EXHIBIT 4

## FILE REVIEW AND HOME VISIT SCHEDULE - SOCIAL

Code _____	(1,2,3)	Cards 2 and 3
AGE _____	(4,5)	OWNERSHIP OF HOUSING (13)
EDUCATION	(6,7)	1 _____ N/A - Does not live in home, apartment, or trailer
Elementary 0 1 2 3 4 5 6 7 8		2 _____ Owns place of living
High School 9 10 11 12		3 _____ Buying place of living
College 13 14 15 16		4 _____ Rents place of living
Graduate 17 18 19 20		5 _____ Lives in parents home
Trade or		6 _____ Lives in child's home
Business 21 22 23		7 _____ Other (Spec.) _____
MARITAL STATUS	(8)	FAMILY ANNUAL INCOME (14)
1 _____ Married		(In hundreds of dollars)
2 _____ Single		1 _____ Full-time competitive personal work or business
3 _____ Separated		2 _____ Part-time sheltered or home- bound personal work or business
4 _____ Divorced		3 _____ Spouse's work
5 _____ Divorced-Remarried		4 _____ Child(ren) work (living with client)
6 _____ Widow/Widower		5 _____ Parent(s) work (living with client)
7 _____ Widow/Widower-Remarried		6 _____ Earnings on savings bonds, investments, etc.
8 _____ Non-legal Cohabitation		7 _____ Bureau of Workman's Compensation
9 _____ Other (Spec.) _____		8 _____ V. A. pension or compensation
NUMBER OF LIVING CHILDREN		9 _____ OASI pension or DIB benefit
(9) _____ Biological Children		0 _____ Other pensions, insurance, etc.
(10) _____ Adopted Children		X _____ Welfare agencies
(11) _____ Step-children		Y _____ Other (Spec.) _____
TYPE OF HOUSING	(12)	\$ _____ Total (15,16,17)
0 _____ Homeless		SIZE OF COMMUNITY OF RESIDENCE
1 _____ Private Home		0 _____ Open Country
2 _____ Public Housing-Apartment		1 _____ Town of less than 25,000
3 _____ Other Apartment		2 _____ City of 25,000 to 249,999
4 _____ Boarding House		3 _____ City of 250,000 or More
5 _____ Rented Room		
6 _____ Nursing Home		
7 _____ Trailer		
8 _____ Institution (Spec.) _____		
9 _____ Other (Spec.) _____		

## EXHIBIT 5

## FILE REVIEW AND HOME VISIT SCHEDULE - PHYSICAL FUNCTION

## ACTIVITIES OF DAILY LIVING

Card 2 and 3

WRITING (19)	EATING (20)	ACTIVITY, GENERAL (31)	
1___ Complete	1___ Complete	1___ Inactive	3___ Active
2___ Partial	2___ Partial		Outside
3___ None	3___ None	2___ Active Inside	4___ Both
SPEECH (21)	DRESSING (22)	PROSTHESES (32)	
1___ Complete	1___ Complete	X___ Adequate	4___ B/E
2___ Partial	2___ Partial	Y___ Does not use	5___ Two B/E
3___ None	3___ None	0___ B/K	6___ A/E
		1___ Two B/K	7___ Two A/E
AMBULATION (23)	WHEELCHAIR (24)	2___ A/K	8___ Eye
1___ Complete	1___ Complete	3___ Two A/K	9___ Other (Spec.)
2___ Partial	2___ Partial		_____
3___ None	3___ None	BRACES (33)	
PERSONAL HYGIENE (25)	BED ACTIVITIES (26)	1___ UE	5___ SL
1___ Complete	1___ Complete	2___ Two UE	6___ Two SL
2___ Partial	2___ Partial	3___ LL	7___ Back
3___ None	3___ None	4___ Two LL	8___ Other (Spec.)
			_____
STAIRS (27)	AUTO TRAVEL (28)	AMBULATION AIDS (34)	
1___ Complete	1___ Complete	1___ Wheelchair	4___ Special Shoes
2___ Partial	2___ Partial	2___ Hand Controls	5___ Walker
3___ None	3___ None	3___ Lift	6___ Other (Spec.)
			_____
SUBWAY TRAVEL (29)	BUS TRAVEL (30)	NON-AMBULATION AIDS (35)	
1___ Complete	1___ Complete	1___ Dentures	4___ Urinals
2___ Partial	2___ Partial	2___ Hearing Aids	5___ ADL Aids
3___ None	3___ None	3___ Glasses	6___ Other (Spec.)
			_____

## EXHIBIT 6

## HOME VISIT SCHEDULE - VOCATIONAL

Code _____	(1,2,3)	Card 4
EMPLOYMENT STATUS _____	1	UNEMPLOYED _____ 2 (4)
OCCUPATION _____		ESTIMATED LOSS OF SKILL DUE TO IMPAIRMENT (12)
D. O. T. CODE _____ (5,6,7)		1 _____ Negligible
		2 _____ Slight
HOW DID SUBJECT OBTAIN THIS EMPLOYMENT (8)		3 _____ Moderate
1 _____ Own Efforts		4 _____ Severe
2 _____ Public Employment Serv.		5 _____ Total
3 _____ Private Employment Serv.		RACE, CREED, COLOR AND NATIONAL ORIGIN AS A HANDICAP TO EMPLOYMENT (13)
4 _____ Advertisement		1 _____ No Handicap
5 _____ Contact by Employer		2 _____ Slight Handicap
6 _____ VR or Other Agency		3 _____ Moderate Handicap
7 _____ Friends		4 _____ Severe Handicap
8 _____ Relatives		MOTIVATION FOR SECURING EMPLOYMENT (14)
9 _____ Other (Spec.) _____		1 _____ Highly Motivated
JOB SATISFACTION (9)		2 _____ Moderately Motivated
1 _____ Very Dissatisfied		3 _____ Motivated but needs encouragement
2 _____ Dissatisfied		4 _____ Low Motivation, Needs Constant Encouragement
3 _____ Undetermined		5 _____ Completely lacking in Motivation
4 _____ Satisfied		FUTURE VOCATIONAL GOALS (15)
5 _____ Very Satisfied		1 _____ Definite specific goals
REASON FOR JOB SATISFACTION (10,11)		2 _____ Somewhat formulated goals
Choose three and rank according to order of importance beginning with 1 as most important reason, 2 second most, etc.		3 _____ Only hazy notion of goals
00 _____ Opportunity for creativity		4 _____ No goals but openable to ideas
01 _____ Pleasant working conditions		5 _____ No intention of working
02 _____ Good pay		DEGREE OF MARKETABLE SKILL (16)
03 _____ Job security		1 _____ Very highly skilled
04 _____ Opportunity for advancement		2 _____ Highly skilled
05 _____ Cordiality of work associates		3 _____ Moderately skilled
06 _____ Independence in work situation		4 _____ Slightly skilled
07 _____ Challenging work		5 _____ Unskilled
08 _____ Little effort required		
09 _____ Other (Spec.) _____		



## EXHIBIT 7

## INTERVIEWER'S IMPRESSIONS OF HOME VISIT SCHEDULE

TO WHAT DEGREE DOES THE SUBJECT BLAME HIS DISABILITY ON THE FOLLOWING?

RATE DEGREE ON A FIVE POINT SCALE

Card 4

		1	2	3	4	5
		NOT AT ALL	SLIGHTLY	MODERATELY	STRONGLY	ENTIRELY
1 2 3 4 5	1 2 3 4 5 Himself (His own carelessness or oversight)(17)				1 2 3 4 5 A firm, company, or owner (19)	
					1 2 3 4 5 Heredity (20)	
1 2 3 4 5	1 2 3 4 5 Another person or persons (not employer)(18)				1 2 3 4 5 Just circumstances, (21) no one's fault	
<hr/>						
DISTRACTIONS DURING INTERVIEW (22)				SUBJECT'S TENSION LEVEL DURING INTERVIEW		
1	No distractions				At Start (26)	At Close (28)
2	Some occasional distractions					
3	Much distraction(radio,TV,etc.)				Nervous Fidgety 1	1
4	Much distraction(other people)				Sporadically Nervous 2	2
COOPERATIVENESS DURING INTERVIEW				Mostly Relaxed 3		
		At Start (23)	During (24)	At Close (25)		
Mostly Cooperative	1	1	1		ATTITUDE TOWARD INTERVIEW (29)	
					1 Friendly	
					2 Indifferent	
					3 Hostile	
Sporadically Cooperative	2	2	2		4 Suspicious	
					5 Solicitous	
					6 Manipulative	
Mostly Uncooperative	3	3	3		7 Evasive	
					8 Other (Spec.)	

## EXHIBIT 8

## LETTER TO PATIENTS NOT CONTACTED DIRECTLY

REHABILITATION INSTITUTE OF CHICAGO  
401 East Ohio Street  
Chicago, Illinois 60611

Mr. Douglas E. Inkster is conducting follow-up interviews with former patients of the Rehabilitation Institute of Chicago. This is part of a research study being carried out under the supervision of Michigan State University.

Mr. Inkster has not been able to schedule a visit to your home; however, he has prepared a checklist which, when complete, will provide him with basic essential information. Although you are not required to participate in this study, your responses will be very helpful to other patients in discovering how rehabilitation services might be improved.

We have been assured that your responses will not be identified with your name. Mr. Inkster is interested in group statistics. That is why the checklist has a number and not a name to identify it. It is expected that this study to find out what has happened to former patients of the Institute will be of benefit to all of us. We hope you will help him, and indirectly us, look at what is needed in rehabilitation.

Sincerely yours,

William Kir-Stimon, Ph.D.  
Director, Personal Services

WKS:jeh

## EXHIBIT 9

No. \_\_\_\_\_ FOLLOW-UP CHECK LIST

Please check the items as they apply to your own situation  
and return this form to us in the enclosed return envelope.

## WRITING

- \_\_\_\_\_ I can write a letter
- \_\_\_\_\_ I can only sign my name
- \_\_\_\_\_ I am not able to write at all

## EATING

- \_\_\_\_\_ I can eat without any assistance
- \_\_\_\_\_ I need help only cutting meat, etc.
- \_\_\_\_\_ I am not able to feed myself

## DRESSING

- \_\_\_\_\_ I can dress completely without assistance
- \_\_\_\_\_ I need help only with Buttons and pull overs
- \_\_\_\_\_ I am not able to dress myself

## SPEECH

- \_\_\_\_\_ I have no trouble speaking
- \_\_\_\_\_ I can say some words and sentences
- \_\_\_\_\_ I am not able to speak

## WALKING

- \_\_\_\_\_ I can walk two blocks or more without help
- \_\_\_\_\_ I can walk only around the house without help
- \_\_\_\_\_ I am not able to walk

## STAIRS

- \_\_\_\_\_ I can walk up one flight of stairs or more without help
- \_\_\_\_\_ I can walk up a few steps with handrails
- \_\_\_\_\_ I am not able to manage steps

## PERSONAL HYGIENE

- \_\_\_\_\_ I can wash, toilet and comb my hair without help
- \_\_\_\_\_ I can wash, toilet and comb my hair with some help
- \_\_\_\_\_ I am not able to wash, toilet or comb my hair

## FOLLOW-UP CHECK LIST (Continued)

Please check the items as they apply to your own situation.

## TRAVEL

- ☐ I can board a bus, train and auto without help  
☐ I can get into an auto without help, but not a bus or train  
☐ I am not able to use transportation without assistance

## AIDS USED IN GETTING ABOUT

- ☐ I use no aids or only a cane  
☐ I use a walker or hang onto furniture  
☐ I use a wheelchair only

## BRACES

- ☐ I use no braces or slings  
☐ I use a short leg brace but no sling  
☐ I use an arm sling but no brace  
☐ I use a brace and arm sling

## ACTIVITY

- ☐ I am active both inside and outside my home  
     How many times a week do you go out? \_\_\_\_\_  
     Where do you go and what do you do? \_\_\_\_\_  
     \_\_\_\_\_  
     \_\_\_\_\_  
     \_\_\_\_\_  
     \_\_\_\_\_

- ☐ I am active inside my home  
     What do you do around the house to keep busy? \_\_\_\_\_  
     \_\_\_\_\_  
     \_\_\_\_\_  
     \_\_\_\_\_  
     \_\_\_\_\_

- ☐ I am not able to be active either in or outside my home



## FOLLOW-UP CHECK LIST (Continued)

Please check the items as they apply to your own situation

## EMPLOYMENT

Yes    No

\_\_\_    \_\_\_ Are you working now?  
If yes, full-time\_\_\_ or part-time\_\_\_?  
Give a brief description of your job duties\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

\_\_\_    \_\_\_ Have you worked since you were hospitalized?  
If yes, full-time\_\_\_ or part-time\_\_\_?  
Give a brief description of your job duties\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

If no to above, have you tried to find work?  
Yes\_\_\_ No\_\_\_

\_\_\_    \_\_\_ Are there jobs you think you can do with your  
handicap? If yes, please list\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Please tell us how you feel about the Rehabilitation Institute of Chicago. Did you get good service? Do you have any suggestions where we could improve our services?

DO NOT SIGN THE FORM! Fold the checklist, insert it in the enclosed stamped return envelope, seal it and mail it immediately. Checklists received after October 25, 1964, will not be considered in the study, so please give this your immediate attention.

## EXHIBIT 10

## POINT VALUES TALLY SHEET

Case	Maintenance of Function Items												Dis.	F-Up	Amt.
	1	2	3	4	5	6	7	8	9	10	11	12	Tot.	Tot.	Chg.
2	1-2	1-1	1-2	2-3	1-3	1-3	1-2	2-3	1-1	1-1	2-3	3-3	17	27	+10
3	2-1	1-1	1-1	2-1	3-1	2-1	1-1	3-2	2-1	1-1	1-1	3-3	22	15	- 7
5	1-3	1-2	1-1	1-1	1-2	1-2	1-2	2-2	2-1	1-1	1-1	3-3	16	21	+ 5
10	3-1	2-1	3-2	3-3	1-1	2-2	2-2	2-2	2-1	1-1	2-2	3-3	26	21	- 5
12	3-3	2-1	3-2	2-2	3-2	2-2	3-2	3-3	2-1	1-1	2-1	3-3	29	23	- 6
13	3-3	2-2	3-3	3-3	3-2	3-2	2-2	3-3	3-2	2-2	3-3	3-3	33	30	- 3
14	1-1	2-1	1-1	1-1	1-1	1-1	1-1	1-1	1-1	1-1	2-1	3-3	16	14	- 2
17	2-1	1-1	1-2	1-1	2-1	1-1	2-2	2-2	2-1	2-2	1-1	3-3	20	18	- 2
21	3-2	2-2	2-3	2-2	2-1	2-1	2-2	3-2	2-1	2-2	2-3	3-3	27	24	- 3
23	1-1	1-1	1-1	1-1	2-3	1-3	1-1	2-3	2-3	1-1	3-2	3-3	19	23	+ 4
25	3-3	2-2	3-3	2-3	3-3	3-3	2-3	3-3	3-3	1-1	3-3	3-3	31	33	+ 2
26	1-1	1-1	1-1	1-1	2-1	2-1	1-1	2-1	2-1	1-1	1-1	3-3	18	14	- 4
28	3-2	1-1	2-1	2-2	2-1	2-1	2-1	3-2	2-1	2-1	2-1	3-3	26	17	- 9
31	1-1	2-1	2-2	1-1	1-1	1-1	1-1	2-1	1-1	2-1	1-1	2-2	17	14	- 3
33	1-1	2-1	1-1	2-1	2-1	1-1	2-2	2-2	2-1	2-2	2-2	3-3	22	18	- 4
35	2-3	1-2	2-3	1-1	3-2	3-3	2-3	3-3	1-2	1-1	3-3	3-3	25	29	+ 4
40	2-2	2-1	1-2	2-1	1-1	1-1	1-1	2-2	1-1	1-1	3-2	3-3	20	18	- 2
42	1-2	1-1	1-2	1-2	1-1	1-1	1-1	1-1	1-1	1-2	1-1	3-3	14	18	+ 4
43	3-2	2-2	2-2	3-3	2-3	2-2	2-2	3-3	2-1	2-2	3-3	3-3	29	28	- 1
47	1-1	1-1	1-2	1-1	2-1	2-1	1-2	2-2	2-1	2-2	3-1	3-3	31	28	- 3
49	1-1	1-1	1-1	2-2	1-1	1-1	1-1	1-1	1-1	1-1	3-1	3-3	17	15	- 2
50	2-2	1-1	1-1	2-2	1-1	2-1	1-1	2-2	2-1	2-2	1-1	3-3	20	18	- 2
55	1-2	1-1	1-1	2-1	1-1	1-1	1-1	1-1	1-1	1-2	1-2	2-2	14	16	+ 2
56	2-1	2-1	1-2	1-1	2-2	2-2	2-2	2-3	2-2	2-2	1-2	3-3	22	23	+ 1
57	2-1	1-1	1-1	1-1	2-1	2-1	2-1	2-2	2-1	1-1	1-1	1-1	18	13	- 5
58	1-1	1-1	1-1	1-1	2-2	2-2	2-2	2-2	2-3	1-1	3-3	3-3	21	22	+ 1
59	2-2	1-2	1-1	2-3	2-2	3-2	1-1	3-2	2-2	2-1	3-2	3-3	25	23	- 2
61	2-1	1-1	2-2	1-1	1-2	3-2	1-1	3-2	3-3	1-1	3-3	3-3	24	22	- 2
65	1-1	1-1	1-1	1-1	1-1	1-1	1-1	1-1	1-1	1-1	1-1	1-1	12	12	0
71	2-2	1-1	1-1	2-3	1-1	2-1	1-2	1-2	2-1	1-1	1-2	3-3	18	20	+ 2
72	1-2	1-1	1-3	1-1	2-1	3-1	2-1	3-2	2-1	2-1	1-1	3-3	22	18	- 4
75	2-2	1-1	3-3	1-1	3-3	3-3	1-3	3-3	3-3	1-1	3-3	3-3	27	29	+ 2
76	1-1	1-1	2-1	1-1	1-1	2-1	1-1	3-2	2-1	1-1	1-1	2-2	18	14	- 4
77	3-3	1-1	1-2	2-1	1-1	2-1	1-2	2-3	1-1	2-2	3-1	3-3	22	21	- 1
79	1-1	2-1	2-2	1-1	2-1	2-1	1-1	3-2	2-1	2-1	1-1	3-3	22	16	- 6
81	2-2	1-1	2-2	1-1	2-1	2-1	2-2	2-2	2-1	2-2	3-1	3-3	24	19	- 5
84	2-2	1-1	1-2	2-3	2-2	2-2	2-2	3-3	2-1	2-2	1-1	3-3	23	24	+ 1
85	2-2	1-1	1-3	2-2	2-2	1-2	1-3	2-3	2-1	2-2	1-3	3-3	20	27	+ 7
88	1-1	1-1	2-3	1-1	2-1	3-1	1-2	3-2	2-1	2-2	1-1	3-3	22	19	- 3
89	3-3	3-2	3-1	2-1	3-2	3-2	3-2	3-2	3-1	1-1	3-1	3-3	33	21	-12
93	1-1	1-1	1-1	1-1	1-2	1-1	1-1	2-2	2-1	1-1	1-1	3-3	16	16	0
94	1-3	1-1	1-1	1-1	1-2	1-1	1-1	2-2	2-1	1-1	1-2	3-3	16	19	+ 3
95	2-2	2-3	2-3	3-3	2-3	1-2	1-3	2-2	2-1	1-2	3-3	3-3	24	30	+ 6
99	2-1	1-1	2-1	1-1	2-2	2-2	1-2	3-2	2-2	2-2	1-3	3-3	22	22	0
100	1-1	1-1	2-1	1-1	2-2	2-3	2-2	3-2	2-2	2-2	1-3	3-3	22	23	+ 1
101	1-1	1-1	1-3	1-2	1-1	2-1	2-2	2-2	2-1	2-1	1-2	3-3	19	20	+ 1



## EXHIBIT 11

Chi-Square Table 1. -- Sibling orientation related to maintenance of function, only child.

Classification	f	F	(f-F)	(f-F) <sup>2</sup>	(f-F) <sup>2</sup> /F
Improved	3	3.33	- .33	.109	.03
Static	1	3.33	-2.33	5.428	1.63
Regressed	6	3.33	+2.66	7.075	2.12
Totals	10	10.00	0.00	-	3.78

$x^2 = 3.78$  Is not significant  $df = 1$   $x^2_{.05} = 3.841$

Chi-Square Table 2. -- Sibling orientation related to maintenance of function, 1 of 2 children.

Classification	f	F	(f-F)	(f-F) <sup>2</sup>	(f-F) <sup>2</sup> /F
Improved	4	3	1	1	1/3
Static	4	3	1	1	1/3
Regressed	1	3	-2	4	4/3
Totals	9	9	0	-	2.0

$x^2 = 2$  Is not significant  $df = 1$   $x^2_{.05} = 3.841$

Chi-Square Table 3. -- Sibling orientation related to maintenance of function, 1 of 3 children.

Classification	f	F	(f-F)	(f-F) <sup>2</sup>	(f-F) <sup>2</sup> /F
Improved	1	1	0	0	0
Static	1	1	0	0	0
Regressed	1	1	0	0	0
Totals	3	3	0	-	0

$\chi^2 = 0$  Is not significant df = 1  $\chi^2_{.05} = 3.841$

Chi-Square Table 4. -- Sibling orientation related to maintenance of function, 1 of 4 children.

Classification	f	F	(f-F)	(f-F) <sup>2</sup>	(f-F) <sup>2</sup> /F
Improved	2	2.33	- .33	.108	.047
Static	1	2.33	-1.33	1.768	.758
Regressed	4	2.33	+1.66	2.755	1.180
Totals	7	7.00	0	-	1.985

$\chi^2 = 1.985$  Is not significant df = 1  $\chi^2_{.05} = 3.841$

Chi-Square Table 5. -- Sibling orientation related to maintenance of function, 1 of 5 or more children.

Classification	f	F	(f-F)	(f-F) <sup>2</sup>	(f-F) <sup>2</sup> /F
Improved	7	5.66	1.34	1.59	0.281
Static	5	5.66	-0.66	0.435	0.763
Regressed	5	5.66	-0.66	0.435	0.763
Totals	17	17.00	0	-	1.707

$\chi^2 = 1.707$  Is not significant  $df = 1$   $\chi^2_{.05} = 3.841$

Chi-Square Table 6. -- Education related to maintenance of function, 0 - 4 of schooling.

Classification	f	F	(f-F)	(f-F) <sup>2</sup>	(f-F) <sup>2</sup> /F
Improved	0	.66	-.66	.4356	.66
Static	1	.66	.33	.1089	.16
Regressed	1	.66	.33	.1089	.16
Totals	2	2.0	0	-	.98

$\chi^2 = .98$  Is not significant  $df = 1$   $\chi^2_{.05} = 3.841$

Chi-Square Table 7. -- Education related to maintenance of function, 5 - 8 of schooling.

Classification	f	F	(f-F)	(f-F) <sup>2</sup>	(f-F) <sup>2</sup> /F
Improved	6	5.33	+ .66	.4356	.081
Static	3	5.33	-2.33	5.428	1.018
Regressed	7	5.33	+1.66	2.756	.517
Totals	16	16	0	-	1.62

$\chi^2 = 1.62$  Is not significant df = 1  $\chi^2_{.05} = 3.841$

Chi-Square Table 8. -- Education related to maintenance of function, 9 - 12 of schooling.

Classification	f	F	(f-F)	(f-F) <sup>2</sup>	(f-F) <sup>2</sup> /F
Improved	8	6.33	1.67	2.788	.440
Static	7	6.33	0.67	.449	.070
Regressed	4	6.33	-2.33	5.43	.857
Totals	19	19.0	0	-	1.367

$\chi^2 = 1.367$  Is not significant df = 1  $\chi^2_{.05} = 3.841$

Chi-Square Table 9. -- Education related to maintenance of function, 13 - 16 of schooling.

Classification	f	F	(f-F)	(f-F) <sup>2</sup>	(f-F) <sup>2</sup> /F
Improved	2	2	0	0	0
Static	1	2	-1	1	1/2
Regressed	3	2	1	1	1/2
Totals	6	6	0	-	1

$x^2 = 1$     Is not significant     $df = 1$      $x^2_{.05} = 3.841$

Chi-Square Table 10. -- Education related to maintenance of function, 17 - 20 of schooling.

Classification	f	F	(f-F)	(f-F) <sup>2</sup>	(f-F) <sup>2</sup> /F
Improved	1	1	0	0	0
Static	0	1	-1	1	1
Regressed	2	1	1	1	1
Totals	3	3	0	-	2

$x^2 = 2$     Is not significant     $df = 1$      $x^2_{.05} = 3.841$



Chi-Square Table 11. -- Time lapse from onset to admission related to maintenance of function, 1 to 3 months.

Classification	f	F	(f-F)	(f-F) <sup>2</sup>	(f-F) <sup>2</sup> /F
Improved	10	5	+5	25	5.0
Static	2	5	-3	9	1.8
Regressed	3	5	-2	4	8
Totals	15	15	0	-	7.6

$x^2 = 7.6$  Significant at 1 percent level  $df = 1$   $x^2_{.05} = 3.841$

Chi-Square Table 12. -- Time lapse from onset to admission related to maintenance of function, over 6 months.

Classification	f	F	(f-F)	(f-F) <sup>2</sup>	(f-F) <sup>2</sup> /F
Improved	4	8	-4	16	2.0
Static	8	8	0	0	0
Regressed	12	8	+4	16	2.0
Totals	24	24	0	-	4.0

$x^2 = 4.0$  Significant at 5 percent level  $df = 1$   $x^2_{.05} = 3.841$



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