

A COMPUTER GUIDANCE PROGRAM FOR  
OCCUPATIONAL THERAPY EVALUATION  
AND TREATMENT PLANNING FOR  
THE SPINAL CORD INJURED PATIENT

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A THESIS

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BY

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## CHAPTER I

### RESEARCH PROBLEM AND BACKGROUND INFORMATION

Providing effectual assistance to students in the transition of applying classroom knowledge to the actual evaluation and programming of patients has long been a difficult task for clinical supervisors. Students begin their training with an abundance of knowledge. Colleges, through their four-year curriculum, have provided information on the human physiology and its function; diseases and injuries and how they affect the human system; methods for determining the degree of deviation from normal; modalities to assist in recovery; and adaptive devices to assist in function. The background and knowledge that the student possesses is probably greater than that possessed by students in past years; however, the problems of application remain the same.

Regardless of the theoretical qualifications of students, all have some degree of difficulty in assessing the physical limitations and recognizing the needs of the patient, establishing goals, and accomplishing goals once established. These uncertainties, when accompanied by the fears of how to meet the patient, what is permissible in handling the patient, and how to present a confident posture to the patient and the staff, are always anxiety-provoking to the novice therapist.

The student supervisor is also caught in the dilemma of how much supervision to give the student and at what point in time to give it. Each student is an individual and each must be given the opportunity to experiment, think, plan, and act according to her own initiative, confidence, and knowledge. The dilemma often becomes that of determining at what point to impose modification of student behavior in order to progress with a program or to restrain too aggressive or misguided behavior. Because there is no formula for dealing with people, be it patient or novice therapist, the student supervisor is often concerned with fulfilling a difficult role with only her expertise and experience to tell her when and how much to assist.

While the author is, in this paper, referring to students and student supervisors, the same problems hold true for inexperienced staff therapists and clinic supervisors. If the supervisor is also lacking in experience, the problem is often compounded and frequently leads to failure and job dissatisfaction for everyone involved.

Because of the problems encountered by students and student supervisors, a new approach using a computer program was developed. The program is limited to the evaluation and program planning for spinal cord injured patients. The purpose of this study is to determine the effectiveness of a computer program in the clinical training of occupational therapy students.

Computers have been used for many years as an adjunct to teaching, as a means of individualizing instructions, to provide refresher courses, and as a means of combating the teacher shortage. Those programs developed in medical instruction have been rewarding and encouraging.

The program for nursing education developed at Mercy Hospital School of Nursing<sup>4</sup> indicated that education by computer could supplement but not replace the teacher. More students could be taught with the same number of faculty, students could progress at their own rate, and the teacher could give more guidance and individual instruction, all of which provided better use of time for the student and the teacher. Although reaction to this program varied, the response from the students showed that with increased use of the program, the students responded more favorably. The fact that the program presented questions that required the student to search for information provided more meaningful experiences for the learner.

Courses have been written for computer, to be used with experienced medical and paramedical personnel, as a means of providing refresher information. Programs such as these can be useful in the continuing education of medical personnel, and have been perceived as being well received as a convenient and enjoyable method of review.<sup>14, 16</sup> This kind of information is usually generated by having

the computer propose questions on material previously reviewed by the user. The student answers the questions using terminology programmed into the computer. If the answer is not recognized by the machine, additional information will be given, to prod or lead the user. In this way, the user is guided by the machine in utilizing his thinking and planning skills. The advantage of this procedure over reading or watching film or audiovisual material is that the user must participate.

Because a student cannot be totally responsible for the decision making in the actual patient care, his educational needs are often never fully met. A program was developed at the University of Illinois College of Medicine<sup>13</sup> to assist medical students in gaining experience in clinical decision making and in observing the consequences of their decisions. This approach allows a student to develop some expertise in evaluating and diagnosing the symptomatology of programmed diagnoses and in following through on the treatment plan from admission to discharge. This method of learning assumes that the user has already acquired knowledge in his field, and allows him to apply that knowledge with immediate feedback on the consequences of his management. An advantage of this kind of program is that it enables a student to develop some academic experience in decision making before he must actually do so in the clinical situation. He is also given the opportunity of dealing with the consequences of his decisions. Another advantage of

the program is that the student can follow the course of the disease from beginning to end, while in the actual situation students see only a portion of the picture because of their rotation through services. Also, in the actual situation there is no control over the variety of health problems encountered, while with this computer program the experiences can be planned and progressive.

Throughout the literature, it is apparent that computers have been proved to have merit in the medical teaching field. Their role, while still being defined and evaluated, must be reckoned with and developed, as the potential is tremendous. The computer has been likened by Spivey to the advent of the printing press as far as the contribution it can make to education is concerned.<sup>20</sup> He further states that education should be efficient, effective, and appropriate and that computers can fill these requirements. With every program written and evaluated, new information is gained that enhances future programs. The literature up to this point seems to suggest that computers can provide new and better methods of teaching at all levels from the beginning student up to the experienced professional. As computers with on-line terminals become more accessible, medical personnel in small outlying communities can avail themselves of the expertise developed in specialty centers and in this way can better cope with unique problems with which they are confronted.



In a relatively short period of time computers have become the handmaiden to medicine. Computers began being introduced into hospitals in the late 1950's. At that time they were primarily considered as information gathering machines to assist in research analysis, data gathering, and storage of information. The need at that time was for a better method of handling the voluminous information being generated on each patient, and making the information more accessible for study. In the very early literature, however, there were already indications of additional benefits to be derived in the patient care area.<sup>19</sup> As computers, and the personnel needed to write programs, became more available, new uses were explored. With the introduction of computers into hospitals came the need for professionals who understood computers, but also understood medicine and the needs of the medical professionals. Much of this understanding came about simply by two disciplines working together on common problems within the hospital. Computer professionals learned the language of medicine and medical professionals learned the computer language. Because of the acceleration of the computer trend in hospitals, and the introduction of computer programs into the patient care area, some medical schools are now offering computer techniques in medical curricula. Such a program is offered at the Kaiser Foundation Hospital, Oakland, California. This course provides the physician with

training in principles, facts, and procedures relating to current and projected medical applications of data processing techniques.<sup>25</sup>

At Texas Institute for Rehabilitation and Research, the role of computers was first investigated in 1957, while plans were being made for construction of the present facility. In 1959, when the building was opened, a computer had been installed in the basement. This system was monitored by the Baylor College of Medicine Teleprocessing System. The major objectives of the early system were 1) to expedite the flow of information among members of the rehabilitation team, 2) to facilitate the use of data for research, 3) to enhance the efficiency of hospital management, and 4) to determine the accurate cost of hospitalization.<sup>23</sup>

As work progressed, many other operations were proposed which would heighten hospital efficiency. By 1967, programs had been implemented to process data collected at the bedside, laboratory data, results of physiological studies, and data pertaining to treatments administered to patients. In addition, there were programs to record physiological monitoring, to calculate fluid and electrolyte requirements, and to perform statistical analysis of the hospital census.<sup>8</sup> The Occupational Therapy Department had become involved with the computer and was beginning to develop an appreciation of application of its use in everyday work. The Occupational Therapy Daily

Treatment Modality Report was established as a computer program, with monthly and year-to-date statistical documents being generated. These documents were, and still are, invaluable in documenting departmental function, progress, and needs. By 1969, the Occupational Therapy Department was deeply involved in a program of on-line daily treatment planning. Now, each therapist is responsible for the information on the total care plan that is pertinent to each of her particular patients.

The patient care plan has been found useful in the following ways: 1) The entire care of each patient is available and is updated daily and provides a daily plan of care to follow for nurses, aides, and therapists. 2) It allows for the planning and documenting of long-term goals. 3) Since the care plan is beside the patient's bed, it enables the patient to participate in his own care with a better understanding of his programs and level of activity. 4) Each department is aware of what other departments are doing and can profit by what has been accomplished. This has made for a close working relationship. 5) The ease of using a terminal has made it possible to revise a patient's program of care with a minimum of effort. 6) There is better utilization of personnel because of a better overall picture of what is needed. 7) As a teaching method, the care plan is valuable for all who work with it.<sup>10</sup>

It can teach an appreciation of the effort afforded by various team

members and of the effort expected from the patient. At times it has been shown that the effort expected from the patient was unreasonable, such as too strenuous or too many activities in too short a time; but, with the terminal always available, and with all team members aware of the problem, changes can be quickly made.

A remote terminal on-line to a computer was installed in the Occupational Therapy Department and staff therapists were taught to use the machine. A great deal of technical information is available, explaining the particular programs, how the total computer program works, and the cost involved; however, this information is not pertinent to this particular project and will not be explored in this paper. It will suffice to say that the equipment is readily available to the Occupational Therapy Department at a cost of \$7.00 to \$10.00 per hour; and the staff, because of the patient care plan, must be familiar with the equipment. It is hoped that through this particular educational guidance program the student will have additional opportunity to use the terminal and increase her speed and skill at entering patient care information.

There are approximately 30 programs currently being utilized at TIRR. Some are designed to instruct other personnel in activities which the patient is expected to be able to do, but none are designed to assist the staff in gathering information or assessing the information

once gathered. The gathering and assessing of information is a prerequisite to the program as mentioned above which disseminates instructions.

Programs have been developed, such as the one at the Harvard Medical School at the Beth Israel Hospital, Boston, Massachusetts,<sup>6</sup> which assist the physician in managing patients with electrolyte and acid-base disorders. The user communicates with the computer through a series of questions asked by the computer. The user, in answering the questions through the clinical and laboratory information available, allows the computer to evaluate the data and give back a listing of diagnostic possibilities, general and specific therapeutic recommendations, precautionary measures, and suggestions of additional laboratory studies and references to medical literature.

Computer programs have also been used in psychiatry as a means of constructing a descriptive diagnosis system. That is, symptom patterns are placed into categories, which in turn are extracted and programmed. The computer program then sorts the information and arranges it into meaningful clusters of diagnoses.<sup>3</sup> These programs, and others, help to substantiate the fact that computers can be programmed to make judgments.

Schwartz has called the computer an intellectual tool which can reshape our present health care system by altering the physician's

role and changing medical education and recruitment.<sup>18</sup> He further suggests that few have explored the potentials of the computer to further health care goals. In all the literature, the opinion is clearly stated that computers will change medicine because changes are needed, and machines can do some tasks more efficiently than humans. What tasks the computer can do is still an unknown quantity, but it behooves all involved in medicine to become acquainted with the computer, and to direct it in a course that will best advance our long-term goals. There are problems but the benefits greatly outweigh the problems, provided we develop new skills and attitudes concerning health care management, the machine, and our own roles.

The program being proposed, for guidance in evaluation and treatment programming, will not eliminate the need for student supervisors with the expertise in student and patient needs. It will, hopefully, assist the student, the novice therapist, and the supervisor to work more effectively.

It is hoped to determine if such a program can allow the student to test her theoretical knowledge by providing her with immediate feedback on what information is needed on a patient, suggestions on how to gather it, and recommendations for additional resources if needed or desired. The student will be able to obtain the needed assistance quickly and at any time, rather than when the

supervisor is available to her. She will also be able to test her ideas on a machine, which theoretically should be less threatening than the supervisor. Just as programs are being developed to help the emotionally unstable individual who often feels more comfortable conversing with a nonthreatening machine in expressing thoughts and inadequacies, so might students gain the same benefits through using the machine. The author does not intend to compare students to psychiatric patients, but to suggest that feelings of inadequacy, to some extent, are present in both groups.

A program such as this was developed at the University of Wisconsin Medical Center and the Division of Mental Hygiene, Madison.<sup>11</sup> In this program, patients, some clearly psychotic, were chosen at random and were asked if they wished to participate in the computer interview program. With minimal instructions the patients were able to follow the program, and their reactions toward being interviewed by a machine were favorable. Some patients, it was felt, may even have been freer in revealing information because of the computer's inability to respond. The patients learned to use the machine effectively and to express their thoughts in a manner meaningful to the machine.

The computer has been demonstrated to be a practical aid in solving the problems of learning skills; it can also assist in solving the

problems of learning to apply skills. Studies at the University of Colorado<sup>12</sup> clearly demonstrate that computer techniques benefit students by assisting them in the effective application of already acquired knowledge. The results of the work done have shown that good judgment can be learned.

The proposed computer program can help students and experienced therapists to achieve a wider range of experience in a shorter period of time and at less expense than current teaching methods permit. The time from first being assigned a new patient until a therapeutic program is established should also be reduced. This premise is based on the availability of the machine and the step-by-step procedures in which the machine will guide the student.

In addition to basic evaluation and treatment planning, the program will attempt to assist the student in the immediate establishment of good rapport, leading to a productive long-term patient-therapist relationship. Good therapy is not based on skillful mechanical techniques alone but on the skillful blending of techniques and a good therapeutic relationship. A program can be written, sensitive to the student's needs, which will impart the expertise of building a relationship, an expertise that comes from experience in working with patients and is so often difficult to transmit to students.

According to the new Rater's Guide, Field Work Performance



Report, prepared by the American Occupational Therapy Association, students must be graded on observations of specific behavior rather than on general impressions.<sup>17</sup> Computer programs can assist the student in performing her assignments more efficiently, promptly, and with more skill and confidence. The supervisor should find that her role can be modified. The procedure now is that after the student meets the new patient, and has evaluated to a limited extent, she discusses her findings with the supervisor. The supervisor asks questions which hopefully will guide the student to further evaluation, and makes suggestions as to what information is needed. This process of partial evaluation and suggestions from the supervisor continues as long as the supervisor feels more information is needed. The same procedures hold true with the program planning, so that while the student is learning and gaining experience, the evaluation and planning is often primarily done by the supervisor. The specific behavior observed in the student then becomes that of the student following instruction and not using independent judgments. The supervisor is often left to judge her own programs and techniques and not the student's.

If the student by using the computer program can arrive at more complete evaluations and programs, she will be more self-sufficient and the supervisor can proceed to observe and evaluate with

less personal involvement. Any time saved in student-supervisor planning can be better utilized by the student to provide more efficient and effective treatment. The supervisor can devote more time to objective observation. The computer program cannot possibly cover all contingencies and the supervisor will be the source for additional information. She will not have less contact with the student, but her role will change from initiator to observer and educator.

A program such as this can also be helpful in defining the role of the occupational therapist. Professional Standards Review Organizations were enacted by Congress in October, 1972, as part of Public Law 92-603.<sup>24</sup> These organizations, at every level of government, will be looking for descriptions and definitions of norms for occupational therapy services. A computer program would establish areas or diagnoses for care, techniques, and modalities of treatment and define initiation and termination dates for such treatment. The scope of such programs could, in the future, if carried out on other disability groups, comprise a set of criteria for occupational therapy services for the physically disabled patient.

Computer science has exerted, and will continue to exert, a major influence on health care. As therapists become more familiar with the benefits provided by machines, so new programs will be initiated and developed — programs which will enhance, not replace,

current efforts. We should use computers to the fullest, not knowing at this point in time where this may lead us, only knowing computer programs can enhance, efficiently, effectively, and economically, what is being done by providing new approaches to old problems.

The program proposed is seen as a new approach to an old problem. It is hoped that the proposed program will initiate a direction for using computer assistance in clinical education for the future.

## CHAPTER II

### METHODOLOGY

The author designed a computer program (see Appendix A) to assist occupational therapy students and new staff members with evaluation and program planning for spinal cord injured patients. It is divided into seven sections:

1. Introduction to the program
2. Prior to meeting the patient
3. Meeting the patient
4. The initial evaluation
5. Documenting the initial evaluation
6. Planning a program
7. Finalizing the program

The information contained in the program is appropriate for any spinal cord injured patient at the time of referral to occupational therapy. The program can be started and stopped as needed. A code allows the program to resume at the exact point where it was stopped. Or, if the student desires, she can review particular sections of the program.

The program presents information and then questions — multiple choice, true-false, and fill-in-the-blank. If the answer chosen

is incorrect, the program explains why the answer is unacceptable and repeats the question. Ten students, enrolled in a university program with a major in Occupational Therapy, participated in this study. All were in clinical training, assigned to Texas Institute for Rehabilitation and Research for a three-months physical disability affiliation. Five students who began their training experience prior to the establishment of the computer program used the conventional method. The five students who followed the establishment of the program used the computer program.

Three evaluation methods were utilized:

1. An impartial panel of two registered therapists were asked to evaluate initial evaluations, evaluations of personal independence, and treatment plans submitted by students. These are the documents the students are required to complete as soon as possible following referral of the patient to occupational therapy.

The therapists were asked to evaluate the papers as to content, the apparent reliability of information, and the clarity of presentation. The documents were Xeroxed from the students' original writing before they had been critiqued by the student supervisor. The name of the patient and the student were eliminated, as was information whether conventional or computer method was used, in order to assist the therapist in a more objective evaluation of the documents. The

evaluators were asked to grade each set of documents on a scale of excellent, good, fair, or poor.

2. The students were given a questionnaire upon completion of their three months' affiliation, but prior to receiving their final grading (see Appendix B). Five had used the conventional method of receiving instructions for evaluation and program planning, and five had used the computer method.

The questions asked were all subjective and were rated on a graduated scale from "very little" to "very much". The scale was divided into seven equal spaces. The students were asked to mark the scale at the point at which they felt they had been at the beginning of their affiliation, and to draw an arrowed line to the point they felt they had achieved.

3. The student supervisor's evaluation was designed to give a comparison of efficiency and effectiveness of the two programs. The questions dealt with the amount of time and assistance given the students, and the time required for the students to complete a quality program.

Nine questions were asked, each to be rated on a scale of "more", "same", "less". The supervisor was asked to consider an average of the behaviors displayed by all the participating students in each group (see Appendix C).

Following the collection of data, the results were analyzed for

each of the three evaluation methods.

The therapists' scores were taken for each group and a mean derived. This one grade was used as the rating they had given for overall merit of each method. A comparison was made of the two groups.

The students' questionnaire was analyzed as follows: The graduated scale the students had used in answering each question was divided into seven equal spaces. One end of the scale was labeled "very little" and one "very much". The students had marked this scale at the point where they felt they were at the beginning of the affiliation, and had drawn an arrowed line to the point to which they felt they had progressed. The number of spaces through which the arrowed line progressed was the number value given the question. This method was used as it was felt the amount of improvement was the important factor, rather than the point where the student had started or stopped. The value numbers for each question from each questionnaire were added together. This procedure was done for the conventional group and for the computer group. The number scores for the two groups were compared.

The student supervisor did one evaluation on the comparison of the two methods. No further analysis was required.

One limitation is the subjective nature of the evaluation

### CHAPTER III

#### ANALYSIS OF DATA

Table 1 presents the therapists' evaluations of eight sets of documents used in the study. Each set, composed of the initial evaluation, the evaluation of personal independence, and the treatment plan, was given an alphabetical letter for identification in tabulating. Four sets were by students counseled in the conventional manner; the computer program was used by the other four.

Table 1  
Therapists' Evaluation of Documents

<u>Set Letter</u>	<u>Method</u>	<u>Grade OTR #1</u>	<u>Grade OTR #2</u>
A	computer	fair	good
B	conventional	fair	excellent
C	computer	fair	excellent
D	conventional	fair	good
E	computer	fair	good
F	conventional	fair	fair
H	conventional	fair	fair
J	computer	good	good



The grade given each set of documents by the therapists demonstrates higher merit for the computer group than for the conventional group, the mean for the computer group being "good" and that for the conventional group "fair".

The information from the student questionnaire (Appendix B) is tabulated in Tables 2 and 3. The number value was obtained by counting the number of spaces through which the student had drawn the arrowed line. Number values for each question were added together to obtain a total. Table 2 represents the results of the students counseled in the conventional manner. Table 3 represents the results of the students using the computer program.

Table 2  
Conventional Counseling

<u>Question</u>	<u>Number Value</u>					<u>Total</u>
1	1	4	1.5	2	4	12.5
2	2	5	1.5	3	4	15.5
3	3	4	1.5	3.5	2	14
4	3	3	2.5	2	3	13.5
5	2	5	2.5	2	4	15.5
6	2	4	0.5	3.5	4	14
7	3	3	1.5	4	3	14.5
8	4	4	1.5	4	3	16.5

Table 2  
(Continued)

9	2	4	1.5	3.5	3	14
10	3	5	0.5	4.5	4	17
11	4	4	0.5	3	3	14.5
12	<u>3</u>	<u>5</u>	<u>1.5</u>	<u>3</u>	<u>3</u>	<u>15.5</u>
Total	32	50	17	38	40	177

Table 3  
Computer Program

<u>Question</u>	<u>Number Value</u>					<u>Total</u>
1	4	4	3	5	4	20
2	4	4	4	4	4	20
3	4	3	4.5	5	4	20.5
4	4	4	5	5	4	23
5	3	3	3	5	3.5	17.5
6	3	2	5	6	4	20
7	4	3.5	5	6	4.5	23
8	4	3	3	4	3.5	17.5
9	4	4.5	5.5	4	4.5	22.5
10	3	3	4	5	4	19
11	4	3	6	6	5	24
12	<u>4</u>	<u>4</u>	<u>6</u>	<u>6</u>	<u>5</u>	<u>25</u>
Total	45	41	54	61	50	251

The tables demonstrate a more positive attitude by the students who had used the computer method. Each question showed a higher score for the computer group, with the smallest increase in Questions 5, 8, and 10. These questions dealt with skill in writing the evaluation, confidence in program planning, and the degree of independent judgment used in program planning. The largest increase is shown in Questions 4, 7, 9, 11, and 12. These questions dealt with knowledge in how to look for information, independent judgment in evaluation, confidence in carrying out a program, and planning of short- and long-term goals.

The results of the student supervisor's evaluation (Appendix C) are shown in Table 4.

Table 4  
Student Supervisor's Evaluation

Averaging the behaviors displayed by the students participating in each group, it appeared that with the computer method:

	more	same	less
1. The aggressiveness with which the students pursued the initial evaluations was	X		
2. The speed with which the initial evaluations were completed was	X		
3. The quality of the initial evaluation was		X	
4. The ability of the students to establish goals without needing suggestions was		X	

Table 4  
(Continued)

	more	same	less
5. The aggressiveness with which the students established their programs was		X	
6. The progressiveness with which the students advanced the programs was	X		
7. The speed with which the students established their programs was	X		
8. The time available for observation was		X	
9. The programs were student initiated and showed independent judgments	X		

## CHAPTER IV

### CONCLUSIONS

This computer program, established to assist students and new therapists with treatment planning for their spinal cord injured patients, has proved to be an effective and enjoyable learning tool. All the evaluations, the students', the registered therapists', and the student supervisor's, consistently demonstrated greater positive achievements from the students using the computer program.

The amount of time each student spent using the program was not documented. The number of times each student used the program and the number of questions answered were retained by the computer, and this information was used in documentation. Because the program can be stopped and restarted easily, students tend to use the terminal for short periods of time at their convenience. The students used the program an average of six times each. The frequency of use and the number of questions answered decreased toward the end of their affiliation.

The computer's memory also retained the number of correct and incorrect answers given by each student. It was thought that this might be interesting documentation as to questions consistently

answered incorrectly. The information proved to be of little value as it was found that the students often gave incorrect answers intentionally in order to see what the program would tell them.

Students usually went through the entire program once. Thereafter, they used only the sections appropriate to a particular patient. The sections most often used were Number 3, the progressive sitting program, and Number 4, program planning. There are indications that the more familiar the students became with what was expected of them, the less they used the program. Therefore, it might be concluded that the program has an early dramatic impact that dwindles in time. This should not be construed as a negative statement, but rather that the program accomplishes the results intended and is then not needed.

Even though not documented by data, students consistently stated that they did enjoy using the program and found it helpful for patient evaluation and planning. The students also stated that they found it a good method of review in preparing for the registry examination. Several students felt that it was helpful in gaining an overall view of patient treatment for spinal cord injured patients at Texas Institute for Rehabilitation and Research. A better understanding of what was expected of students during their affiliation was also attributed to the program.

## CHAPTER V

### IMPLICATIONS

The information in the computer program could have been written in a brochure using the same general format. Although the information would be the same, it is doubtful that the results would be as effective. A primary factor, the novelty of the computer, would be lost. The computer is interesting, challenging, enjoyable, and a new approach to learning. However, the cost of the computer system makes it an expensive learning tool as compared to a brochure.

If a computer system is available in an institution, it should be utilized to the greatest extent and for the most creative uses possible. Computer teaching programs can be very creatively and beneficially devised for the student. A teaching program such as this, for a few students, would not make the cost of the computer system a logical investment if the teaching program was the computer's only use.

Computer learning programs provide a unique approach to teaching and have definite advantages over other learning programs. The programs are no more difficult to write than other teaching instructions and are easily entered into the machine. For the author, the planning of the computer program was as interesting, challenging,

enjoyable, and novel in its approach to learning as the program was for the students who used it. The information in the program can be modified or deleted quickly and can therefore be changed when needed to best conform to the students' needs.

With all the advantages, the cost of the system will continue to be a negative factor and will prohibit computer programs from being effectively utilized in clinical situations. This is unfortunate, as the quick, dynamic impact of the computer program makes it an ideal learning tool for short-term intensive training programs. Through computer research, less expensive hardware is being developed. It is hoped that the future will bring the equipment needed so that programs such as this will be within the practical reach of other occupational therapy clinics.



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## APPENDICES

## APPENDIX A

### Sample Computer Program Evaluation and Program Planning for the Spinal Cord Injured

#### I. Introduction

This is a program written to assist you in the evaluation and program planning of your spinal cord injured patient. Until you gain some experience, it will be difficult for you to know how to begin, what to look for, and which activities would do best. Nothing programmed can tell you exactly what to do because every patient is different, but it is hoped that this program will offer you suggestions -- not to tell you what to do but to guide you in refining your own judgment and in using your own creativity in what you can do.

#### II. Before you meet your patient

When a new patient is assigned to you, you need to go meet him as soon as possible. Before you do, you should read whatever information is available on the medical chart. Be sure you find out his name, age, admitting diagnosis, how and when injured, any secondary problems present, and any other information which will help you with your patient. You should also know what your orders are, the time your patient is scheduled for O. T., and whether you will be seeing him in the department or on the ward. If your orders include a category number, look up the category listing to find out what activities are permissible.

\*Which of the following should you know before meeting your patient?

1. Name
2. Age
3. Admitting diagnosis
4. When injured
5. Height and weight
6. Time scheduled for O. T.

5. - Incorrect. Will be important later but not necessarily when you first meet the patient.

1., 2., 3., 4., 6. - Correct.

### III. Now go and meet your patient

Remember that your patient is new to his injury and to this hospital. He is looking to you for help. Be friendly, reassuring, and confident. Also, remember that you know a lot more about Occupational Therapy than he does, so introduce yourself. Tell him who you are, what department you are from, and what you will be doing for him. Tell him when and where he will be receiving his occupational therapy. Try to engage him in some conversation. You might start off with asking him where he is from. Take your cue from him. If you get the feeling he does not want to talk, don't push; you can get more information later.

\*When you meet your patient you should tell him

1. Who you are
2. What department you are from
3. What you will be doing for him
4. When you will be seeing him
5. The latest gossip on the other patients in the ward

5. - Incorrect. If you picked 5., you are really in for a hard time. Try again and think!

1., 2., 3., 4. - Correct.

### IV. How and where to begin

The first thing you need to do is your initial evaluation. This should include the Evaluation of Personal Independence (EPI), grip measurements and prehension measurements, muscle strengths, range of motion, dominance, hobbies and interests, and equipment owned by the patient. Remember, your initial evaluation is the record of your patient when you first see him, not after you begin adapting equipment for him or start your program.

\*If your patient is a C4 quad, which evaluation procedure would you not record?

1. EPI
2. Grip measurements-prehension
3. Muscle strengths
4. ROM
5. Dominance

- 6. Equipment
- 7. Hobbies and interests

2. - Correct.

1., 3., 4., 6., 7. - Incorrect. EPI, muscle strength, ROM, dominance, equipment, hobbies and interests are all important regardless of the level of injury.

5. - Incorrect. This will be very important when you start functional activities.

Be sure you get the patient into the most functional position possible when testing. If in bed and you are testing activities, he would do best on his side with his most functional arm on top. If your orders include sitting, proceed with the sitting before you evaluate.

If your patient has already established his vertical tolerance, that is, he has been sitting several hours a day with no dizziness, check to see if he has his own wheel chair. If he has his chair, check it and make sure it is functional, detachable arms, etc. If he does not have one or if his is inadequate, you will need to issue him one from the O. T. pool.

If your orders are for a progressive sitting program, start with a full reclining back wheel chair. Next add the head rest extension and the seat, back, and head cushions. Don't forget the safety belt.

Before time for the patient to come to O. T., check with Nursing so he will be dressed with binder and hose and with a leg bag. Make sure you know how to work the wheel chair and that the lift and sling are available.

When the patient arrives in O. T., tell him what you will be doing. Have the blood pressure forms, the sphygmomanometer, the wheel chair at about a 40° angle, and the sling available. Take the patient's blood pressure so you will know what you are starting with. Now get another staff member to help you get the patient into the chair.

After the patient is in the chair, check and see if he looks comfortable; that is, sitting straight with his feet on the foot rests. Also look for any signs of pallor, sweating, flushing, etc. Adjust the foot rests and take his blood pressure. The blood pressure should stay above 90 systolic. About every 10 minutes take the blood pressure. If it is stable or is rising, take the chair to a higher angle. Be prepared

to lower the angle if the blood pressure drops, or the patient is dizzy or nauseous. Remember, any time you go from reclined to sitting, the blood pressure will tend to drop, but it should begin to rebound within a few minutes.

Your goal with sitting is to get the patient to a  $90^{\circ}$  angle as soon as possible. All quads would do well to have a pool lapboard issued to them.

\*At what angle do you have the chair when you begin your sitting program?

$40^{\circ}$  - Correct.

\*Before you transfer the patient to the chair you should

1. Check blood pressure
2. Explain what you will be doing
3. Have wheel chair positioned properly
4. Explain how the sphygmomanometer works
5. Check with the patient as to how he feels

1., 2., 3., 5. - Correct.

4. - Incorrect. It is not necessary to explain how the thing works, even if you know. If he should ask, just say "it will record your blood pressure".

The O. T. part of the evaluation of personal independence (EPI) records the stationary activities your patient can do. If you are not familiar with doing the EPI, read the manual before you start. It is a good idea to have the manual with you and follow it for each category while you are doing the test. If your patient has normal uppers, you may not need to go through each category with your patient demonstrating. Do get the writing samples and a signature. (Remember, some people are illiterate but they probably won't admit it to you.) If your patient tells you he does all the activities, follow up by checking him out on the ward for eating and grooming. If there is any involvement in the upper extremities and your patient says he can do the activity, have him demonstrate for you. Watching the patient is the only way you can accurately grade him. Accuracy on the first test is very important. If it is not correct, it will make your following test very hard to grade. Also, remember that "normal" means normal. If you are in a wheel



chair or have the use of only one hand, you may be "good" but not "normal".

Usually the first day you will only have time to do the communication skills and some of the muscle testing. Talk to the patient about the hygiene activities and tell him about bringing his hygiene equipment with him the next day. While you are doing the evaluation of personal independence, take the opportunity to get acquainted with your patient and let him get to know you.

\*Your patient is a recent injury; on which of the following would you probably do a complete check of each category?

C4, C6, T4, L2

C4. - Incorrect. If your patient is a high quad, he will not be able to do the activities except for speaking and signaling.

C6. - Incorrect, because as a new injury he probably has not tried to do anything. If he says he can do some of the activities, have him demonstrate for you.

Hint: Two of the choices are correct.

T4 and L2 - Correct.

\*With an injury which is three years post onset, on which of the following would you probably do a complete check of each category?

C4, C6, T4, L2

All correct; in three years, all four levels of injury, C4, C6, T4, L2, should have mastered some skills.

\*If your patient is not medically cleared for sitting, would you grade sitting N, G, F, P, T, O, X?

X - Incorrect. Sitting is indicated for a person of this age and sex. Try again.

O - Correct.

N, G, F, P, T - Incorrect. Read the instructions in the student notebook concerning the EPI and then try again.

## Grip and prehension measurement

The forms and all instructions are in the student notebook.

Make sure the patient does them correctly and be sure to date the forms. If the results do not appear accurate, try again the next day before you record the results. If the patient is tired, he may not do well.

\*Would you take grip measurements on a C6 quad? Yes No

No - Correct.

Yes - Grip measurement implies that you have finger flexors. Go look at a neuroanatomy book and make a list of all the finger flexors innervated by C6 or above.

If you do record grip measurements on a patient without finger flexors, be sure you state that it is tenodesis action.

\*Could you record grip measurements on a C7 quad? Yes No

No - Incorrect. This patient should have finger flexors. Go look at the neuroanatomy book and make a list of the muscles innervated at C7 and above.

Yes - Correct.

\*If intrinsic are not functional but the long flexors are, would you get a higher grip measurement in the 1st or the 4th notch?

4th notch - Correct.

1st notch - Incorrect. This is the smallest spacing and will require a strong MCP flexion. Try it with your own hand and you will see.

Muscle strength and range of motion (ROM)

These can be checked together, but do not confuse the two when reporting. Range of motion is the range a joint can be passively moved through. Muscle strength is not the same as active range of motion.

\*What grade must a muscle have before it can move a joint through a range against gravity?

1. Trace 2. Poor 3. Fair 4. Good

3. Fair - Correct

1., 2., 4. - Incorrect. Let's review the meaning of these terms:

Trace - a contraction can be felt  
 Poor - can move joint with gravity eliminated  
 Fair - can move joint against gravity  
 Good - can move joint against gravity and resistance  
 Normal - obvious

A few things to remember when you do your testing:

1. Know how to check each muscle or group of muscles. Know how to check against gravity and with gravity eliminated. Most of all, if you raise the patient's arm up from the bed, don't let go unless you know he can hold it. If you let his arm fall and hit him in the face, he is going to lose a lot of confidence in you.
2. Be gentle. Your patient may have tightness so go slowly and tell him to let you know if it starts to hurt; also watch his face for a grimace because he may be hesitant to admit that it hurts. Also remember that he may lack sensation so if you meet resistance, go very slowly. The resistance may be spasticity or joint tightness. With spasticity, if you move the joint back and forth, you should be able to work through it. If it is joint tightness, the point of stopping will stay constant.
3. Don't be afraid to handle the patient. You cannot check muscle strength or range of motion unless you take a firm steady hold on the arm. Holding onto an arm is like riding a horse bareback -- you can feel what the muscles are doing.
4. Tell the patient what motion you are checking. Showing him might be even better.
5. Block out all joints except the one you are checking to rule out substitution.

\*When doing your evaluation of ROM and muscle strength, you should

1. Check each muscle or group of muscles
2. Record active and passive ROM
3. Be gentle and go slow until you know your patient
4. Ask the patient if he can do the motions

1. and 3. - Correct.
2. - Incorrect. You can record the active ROM but it won't tell you the whole picture.
4. - Incorrect. When doing your evaluation of ROM and muscle strength, you should check each muscle or group of muscles and be gentle and go slow until you know your patient.

Before you continue, let's think about the levels of injury. Most of the time, the diagnosed level you will find on the face sheet is describing the vertebrae which have been injured; or, if it is a subluxation, it will list the vertebra above and below the subluxation (C4-C5). The bony level is not the same as the motor level, and the motor level will determine the function you have to work with. The motor level may be above the actual injury (as in the case of ascending swelling) or below the injury (as in the case of incomplete lesions where some fibers are spared).

Also remember that there are 7 cervical vertebrae and 8 cervical nerves. Although this is over-simplifying, a good way to remember is that theoretically if the C7 vertebra is injured, the C7 nerve would probably be damaged but the C8 nerve should be intact. The nerve (C7) is above its corresponding vertebra (C7). Another thing to remember is that muscles are innervated from several different levels, not usually just one. This means that some innervation of a muscle can come from a segment higher than what the textbook lists as the innervated level.

\*What is the diagnosed level of spinal cord function for your patient?

1. C1 or C2
2. C3 or C4
3. C5
4. C6
5. C7
6. C8

\*Which of the following muscle groups should have at least partial function for your patient?

1. Intrinsic of the hand
2. Deltoids, biceps, and supenators
3. Wrist flexors, finger flexors, and finger extensors
4. Wrist extensors, triceps, and pronators

- 5. Trapezius
- 6. None of these

[ If the wrong answer is given, the program goes through the following. ]

\*What is the highest level lesion in which you would expect function of the intrinsic of the hands?

- |       |       |       |       |
|-------|-------|-------|-------|
| 1. C1 | 3. C3 | 5. C5 | 7. C7 |
| 2. C2 | 4. C4 | 6. C6 | 8. C8 |

8. - Correct.

\*What is the highest level lesion in which you would expect function of the deltoids, pectorales, biceps, supinators?

- |       |       |       |       |
|-------|-------|-------|-------|
| 1. C1 | 3. C3 | 5. C5 | 7. C7 |
| 2. C2 | 4. C4 | 6. C6 | 8. C8 |

5. - Correct.

\*What is the highest level lesion in which you would expect function of wrist flexors, finger flexors, finger extensors?

- |       |       |       |       |
|-------|-------|-------|-------|
| 1. C1 | 3. C3 | 5. C5 | 7. C7 |
| 2. C2 | 4. C4 | 6. C6 | 8. C8 |

7. - Correct.

\*What is the highest level lesion in which you would expect function of wrist extensors, triceps, and pronators?

- |       |       |       |       |
|-------|-------|-------|-------|
| 1. C1 | 3. C3 | 5. C5 | 7. C7 |
| 2. C2 | 4. C4 | 6. C6 | 8. C8 |

6. - Correct.

\*What is the highest level lesion in which you would expect function in trapezius?

- |       |       |       |       |
|-------|-------|-------|-------|
| 1. C1 | 3. C3 | 5. C5 | 7. C7 |
| 2. C2 | 4. C4 | 6. C6 | 8. C8 |

## 3. - Correct.

[ Following this, the program returns to the question "Which of the following muscle groups should have at least partial function for your patient? "

\*Check your patient now. Do you still feel he has the musculature you listed for his diagnosed functional level? Is he the same level on the left and the right?

If you are not sure how to check for muscle strength, spend a little time reading in "Muscle Testing" by Daniels, Williams and Worthingham.

In the upper extremity, you will need to check the range of motion for the shoulder, the elbow, the forearm, the wrist, the fingers, and the thumb.

The next series of questions will ask what motions (eg. , flexion, pronation, etc.) you should check in each case. You should respond by typing in your answer. If you do not answer entirely correctly the first time, you will be given an opportunity to add additional answers. You need not retype those which you already answered.

Let's start with an easy one:

\*What motions will you evaluate in the elbow?

Flexion  
Extension

\*What motions will you evaluate in the shoulder?

Abduction	Horizontal adduction
Adduction	Horizontal abduction
Forward flexion	Internal rotation
Extension	External rotation

\*What motions will you evaluate in the forearm?

Pronation  
Supination

\*What motions will you evaluate in the wrist?

Flexion  
Extension

\*What motions will you evaluate in the fingers?

Flexion	Abduction
Extension	Adduction

\*What motions will you evaluate in the thumb?

Opposition	Abduction
Flexion	Adduction
Extension	

\*To passively take a joint through its range is:

Active ROM  
Muscle strength  
Passive ROM

Passive ROM - Correct.  
Active ROM or muscle strength - Incorrect.

\*The range a patient can take a joint through against gravity is:

Active ROM  
Passive ROM  
Muscle strength

Active ROM - Correct.  
Muscle strength - This is not the answer expected because the muscle strength may be below what is needed to go through a range against gravity.  
Passive ROM - Incorrect.

\*With gravity eliminated, the patient can move the joint through partial range. He has:

Active ROM  
Passive ROM  
Muscle strength

Active ROM - Incorrect, because he may have active range but in that case gravity would not need to be eliminated.

Passive ROM - Incorrect. This would not be the answer because the question states the patient is moving the joint.

Muscle strength - Correct.

### Dominance

This should be recorded in the initial evaluation. It will be important in planning your program and recommending equipment.

\*Is dominance important in a C2 quad? Yes No

No - Correct. If patient is complete at the C2 level, it probably will be of no concern. If incomplete, however, it may become important later.

Yes - Incorrect.

### Equipment

When you check equipment, ask in the patient's terminology what you want to know, such as : hand splints to hold your hand, or to help you do activities. Does he have a wheel chair and/or cushion; is it his, or rented or loaned? Where are these pieces of equipment and has he been using them? If they seem to be adequate and useful and are at home, try to have them brought in; if they are in the hospital, go get them as soon as you have time and check them.

### Hobbies and Interests

This you should have been picking up as you went along. If he says he has no interests, ask him what he used to do in his spare time: suggest games, sports, gardening, reading, etc.

## V. Documenting the Initial Evaluation

Your initial information needs to be written as soon as possible. If you wait too long, you will begin to get confused about what he is doing now and what he was doing when you first saw him. Be concise in your evaluation, but try to draw a meaningful picture of your patient and what he can do.

The independence level needs to be put into the computer as soon as you have evaluated the activities. Do you need to enter sitting information? Consider the equipment category and any additional information necessary for the other departments to know.



Keep a list of all equipment you issue the patient. This can go under equipment on the patient care plan. Be sure you modify the entry as you change equipment. Put the patient's name with masking tape on any equipment going to the ward, and be sure to record the number of the wheel chair on the chart behind the door.

\*When you finish your evaluation, list the three things you should do immediately.

Write initial evaluation  
Record equipment  
Enter computer information

[ Any answer not containing the words evaluation, equipment,  
and computer will not be acceptable. ]

VI. Now you are ready to plan your program

First, we need to know some things about the patient's situation:

Where will you be treating the patient?

1. Ward
2. O. T.

How will he be positioned?

1. Bed or flat position
2. Wheel chair

A note before you answer the next question -- If your patient's involvement is equal bilaterally, the instruction will be the same for both right and left extremities, and one number is all that is needed. If not symmetrical, record the number which describes the stronger extremity first. After you have finished reading the program for this extremity, you can review this section for the weaker extremity.

Which of the following muscle groups is functioning fair or better?

1. Normal uppers
2. None of the following

3. Trapezius
4. Shoulders
5. Biceps
6. Wrist extensors
7. Fingers

With these questions answered, proceed. The following will offer suggestions for activities, exercises, ADL, and equipment needs. Adapt it to your patient's interests and needs.

Remember, dominance affects the entire upper extremity. Dexterity will be best in the dominant extremity; so unless there is a great deal less strength in the dominant arm, this is the arm with which the patient will do best.

Also, age makes a difference; the very young have difficulty planning and following detailed instruction. Everything should be kept uncomplicated and natural. The very old (and this may be physiologically as well as chronologically) have difficulty adapting to new methods and may appear to be unmotivated or resistive. Again, try to keep things simple.

Always listen to what your patient is telling you. If he does not want to do something, you cannot make him, but explain and give a lot of encouragement. You and your patient need to work together. Sometimes the most disagreeable patient is really only looking for reassurance and encouragement. But don't be manipulated. You know what must be done, so you do the manipulating and stay in charge of the program.

Now, to consider activities, ADL, exercise, and equipment . .

Your patient will be seen on ward, in bed, with normal uppers.

**Activities** - Plan activities to maintain strength and avocational interests such as leather, cord knotting, light wood work, etc. ; have him do as much of the work as possible. Remember to take down overbed table, lap cloth, and all tools you need for activity, but don't leave them on the ward.

**Exercises** - Hand grip exercise (Big Grip, etc.)

ADL            Should do all activities with help in setting up.

WATCH level.

Equipment - None.

Your patient will be seen in O. T. in bed with normal uppers.

Activities - Plan activities to maintain strength and avocational interests such as leather, cord knotting, light wood work, etc.; have him do as much of the work as possible. You will need overbed table and lap cloth.

Exercises - Hand grip exercise (Big Grip, etc.)

ADL -            Should do all activities with help for setting up.

WATCH level

Equipment - None.

Your patient is in the wheel chair, on the ward, with normal uppers.

Your patient should be coming to the department. Is there some good reason why he isn't? Anyway, the information is the same as for a patient in a wheel chair, in O. T., with normal uppers. Let's look at this program.

Your patient is in O. T. on a progressive sitting program with normal uppers. With normal uppers, he should do well sitting so plan your program for upright sitting.

Activities - Your activities can be anything you can interest him in. You want to maintain strength and encourage avocational interests. Try to plan activities which are strengthening. If he is on the Orthopedic Category System, remember to eliminate torque.

Torque is any twisting of the trunk. Further along in program, consider driving evaluation and home-making.

Exercises- If the activities are strengthening, the patient does not really need exercises. You could use Big Grip but you are not being very creative as an O. T.

ADL NO HELP level.

Equipment- Following prognosis conference, will need to be measured for wheel chair cushion.

\*Do you have questions concerning a progressive sitting program?

Yes No

[ If answer is yes, program will review progressive sitting section.]

Your patient will be seen on the ward in bed and has no functioning musculature below the neck level.

Activities - This will be a mouthstick patient who will have respiratory equipment. Introduce the mouthstick by explaining how it is used and what it can be used for. Easiest activities are for painting, including ceramics, stenciling, and decoupage. Try to become very familiar with the breathing equipment so that you become confident and the patient will be too. Make sure you always have an ambu bag handy.

Exercises- Passive ROM to uppers. Watch for any trace motions coming in.

ADL None (DO FOR level).

Equipment- Mouthstick.

Your patient is in bed, in O. T. , with no functional musculature below the neck level. The information would be the same as for a patient on the ward in bed and with no functional musculature below the neck level, so let's review that program.

Your patient is on the ward, in a wheel chair, and has no functional musculature below the neck level.

Activities - All activities are with a mouthstick. All progressive wheel chair sitting with a respiratory patient should be started on the ward. Use a lot of care in transferring and be sure the ambu bag and suction machine are handy at all times. Activities should include painting, ceramics, decoupage, reading.

Exercises- Passive ROM to uppers. Watch for any trace motions coming in.

ADL - None (DO FOR level).

Equipment- Mouthstick. Consider hand positioners.

\*Do you have questions concerning a progressive sitting program?

Yes      No

[ If answer is yes, program will review progressive sitting section. ]

Your patient is in O. T. in wheel chair with no functional musculature below the neck level.

Activities - As soon as you are comfortable with the transferring and the patient sits without difficulty, check with the physician about coming to O. T. Be sure you have the ambu bag and suction machine at all times. With a respiratory patient, 80° is a good functional level in a wheel chair. Increase the length of time and the number of times as much as the patient tolerates. Mouthstick activity can

include painting, ceramics, typing, turning pages, games such as cards, and dominoes.

Exercises- Passive ROM to uppers. Watch for any trace motion.

ADL - None (DO FOR level).

Equipment- After the prognosis conference, measure for wheel chair cushion, lapboard, side and/or head positioners, hand positioning orthoses, reading rack, electric page turner, electric typewriter. Modified electronic equipment as interests dictate.

\*Do you have questions concerning a progressive sitting program?

Yes No

[ If answer is yes, program will review progressive sitting section. ]

Your patient is on the ward in bed and has trapezius working.

Your program will be the same as for a patient on the ward, in bed, and with no functional musculature, so let's review that program.

Your patient is in O. T., in bed and has trapezius working.

The program would be the same as for a patient on the ward, in bed, and with no functional musculature, so let's review that program.

Your patient is on the ward in a wheel chair with only trapezius working.

The program will be the same as for a patient on the ward in a wheel chair and with no functional musculature, so let's review that program.

Your patient is in O. T. in a wheel chair with only trapezius working.

Activities - Try bilateral slings. It will probably not lead to any functional activities but the patient can bounce his arms, and enjoys the exercise. Otherwise the program will be the same as for a patient in O. T., in a wheel chair, and with no functional musculature. Let's look at that program.

Your patient is on the ward in bed and he has deltoids.

Activities - While on the ward, you will not have slings to use so you will be limited in arm activities. If an overhead bar could be attached to the bed, you could use slings. Check with Nursing to see if a bar could be applied. Otherwise, activities will have to be mouthstick. Try painting, ceramics, decoupageing.

Exercises- Work hard on progressive resistive exercise to all functional musculature. Go through range of motion and watch for some biceps showing up. If you have been able to get an overhead bar and slings, you can use it for some good exercise.

ADL - None (DO FOR level).

Equipment- None.

Your patient is in O. T. in bed and has deltoid function.

Activities - Use slings; you can attach a clip to the hand and do leather lacing, painting, ceramics, etc.

Exercises- Slings give good exercise but be sure you do daily passive ROM to all joints. Do progressive resistive exercise to shoulders and all functional musculature.

ADL - None (DO FOR level).

Equipment- None.

Your patient is on ward in wheel chair and has deltoid function.

Check to see if there is any reason for not bringing the patient to O. T. He should be able to come. If he cannot come to the department, the program will be the same as for a patient in O. T., in a wheel chair, and with deltoid functioning. Let's look at that program now.

Your patient is in O. T. in wheel chair and has deltoid functioning.

Activities - Slings will be important to this patient. As soon as he is tolerating 70°, attach sling posts and sling to his wheel chair. Activities will still be limited to attaching a clip to the hand. He can continue to work on lacing, painting, typing, page turning. You might try a suspension feeder and see if you can work any kind of lapboard to mouth motion.

Exercises- Go through passive ROM daily and watch for any returning musculature. Do progressive resistive exercise to all functioning musculature.

ADL None (DO FOR level). If you get any biceps, you probably will be able to do some self-feeding and maybe some other ADL.

Equipment- After prognosis conference, measure for wheel chair, cushion, lapboard. May need side positioners. Should be able to use an upright wheel chair. Should have slings on wheel chair and hand positioning orthoses. Consider electric page turner, type-writer, or electronic equipment as interest of patient dictates. Consider an external power arm unit; and if it seems indicated, talk to the physician about an orthotics consult. An external power arm



unit can be of some functional value but it will take a lot of work and adaptive equipment.

Your patient is in bed on ward and has biceps.

Activities - Limited activities on ward because you need slings. Check with Nursing to see if an overhead bar could be attached to the bed. If not, this patient would do best on his side, with his stronger arm on top. He could do some lacing with a clip attached to his hand.

Exercises- Do passive ROM to all uppers. Watch for wrist extension. Do progressive resistive exercise with all functional musculature. If you can get an overhead bar on the bed, it will be good for exercise.

ADL - None (DO FOR level).

Equipment- None.

Your patient is in O. T., in bed, and has biceps.

Activities - Now you can use slings. Will still need to use a clip on the hand but can do lacing, painting, stenciling. Work for controlled motion of bringing the hand to the chin; this will help when you start your ADL skills.

Exercises- Do passive ROM to all upper extremities and watch for any wrist extension. Should have supination, so be sure you work on this. Without triceps, he may begin tightening in flexion, so work on this too. Do progressive resistive exercise to all musculature.

ADL None (DO FOR level).

Equipment- None.

Your patient is on ward, in wheel chair, and has biceps.

He should be able to come to the department so check to see if he can. If he cannot come, the instructions are the same as for a patient in O. T., in a wheel chair, who has functioning biceps. Let's look at that program.

Your patient is in O. T., in wheel chair, and has biceps.

**Activities** - As soon as your patient is at 70°, you can begin some self-care activities and, if you have been working on shoulders and biceps, should not need slings. If biceps or shoulders still fatigue, you may need to continue to use a suspension feeder or ball bearing feeders. He can do lacing, painting, typing, page turning.

**Exercises** - Do passive ROM to all upper extremity joints and watch for any wrist extension. If you are doing strengthening activities, you can eliminate progressive resistive exercise.

**ADL** - With equipment, your patient should be able to do eating, shaving, teeth brushing, make up, and writing. Consider driving evaluation and home-making if indicated.

**Equipment** - Consider a consult for an external power unit. This will give finger prehension and can greatly increase function, but it will require a lot of interest and work from your patient. If you do not feel your patient is ready for a power unit, consider a tube splint. After prognosis conference, measure for a wheel chair, possibly motorized wheel chair, lapboard, cushion. Consider any special equipment according to your patient's interests.

\*Do you have questions concerning a progressive sitting program?

Yes    No

[ If answer is yes, program will review progressive sitting section. ]

Your patient is on the ward, in bed, and has wrist extensors.

**Activities** - This patient can do activities well in bed. Because his triceps are weak, he might be best positioned on his side. You might want to use prism glasses to help him see what he is doing. If his triceps are fair or better, he can hold his arms up and see what he is doing. With no hand function, he will need tools or equipment attached to his hand. Utensil cuffs are often helpful.

**Exercises**- Work on wrist extension with progressive resistive exercise. If there is any extensor ulnaris, work hard to maintain an equal pull between extensor radialis and ulnaris. ROM can be limited to finger joints. Watch for finger function but don't be confused by the wrist tenodesis action.

**ADL** - It is possible to do some ADL, but if the positioning is awkward and you expect he will start sitting in a few weeks, it may not be practical. If you decide to do some ADL, start with eating using prism glasses.

**Equipment**- If the wrist is good to normal, he is ready to be measured for reciprocals.

Your patient is in O. T., in bed, and has wrist extensors.

The program will be the same as for a patient on the ward, in bed, with wrist extensors, so let's look at that program.

Your patient is in a wheel chair on the ward and has wrist extensors.

If he can be up in a wheel chair, he should be able to come to O. T. Check and see if he can. If he cannot, the program will be the same as for a patient in a wheel chair, in O. T., with wrist extensors. Let's look at that program next.

Your patient is in a wheel chair, in O. T., and has wrist extensors.

Activities - Without reciprocals, you will still be using a clip on the hand. If there is a pool reciprocal that fits, you could begin using it for some training activities, but hold off on major activities until the patient gets his own equipment. With reciprocal training, begin with stacking blocks, learning to set telescoping rod, and removing hand splints. When the patient is tolerating 70° in his wheel chair, he can do more activities, especially those requiring picking up and releasing.

Exercises- If there are any finger muscles working, do progressive resistive exercise to the fingers, otherwise exercise will not be needed if activities are well planned out.

ADL - Once the patient is sitting 70°, begin ADL. Begin with eating, then hygiene activities, and work on putting on reciprocals. Writing should be one of the last activities as it requires a great deal of dexterity. Toward end of program, consider driving evaluation and homemaking.

Equipment- After prognosis conference, measure for wheel chair with quad rims -- cushion lapboard. Your patient should not need adapted equipment unless for some special skill, such as a knife holder for cutting meat. He will need a skin check mirror. Reciprocal should have already been received. If fingers are tightening up in flexion, you may need to order platforms.

\*Do you have questions concerning a progressive sitting program?

Yes        No

[ If answer is yes, program will review progressive sitting section. ]

**Your patient is on the ward in bed and has finger musculature.**

**Activities** - This patient will need no special equipment unless you see incorrect patterns of motion. Plan your activities carefully to strengthen the finger motions, and watch for any substitution. Do not allow the patient to use the wrist to get a stronger prehension. If the finger muscles do not develop enough strength, the wrist can be used later but now do light activities using only fingers.

**Exercises**- Progressive resistive exercise to fingers is excellent. Also, it will help you to know exactly what muscles are working and how strong they are. Intrinsic will be the weakest, so work on these.

**ADL** - Can do ADL in bed, but may need some help with preparing and may need prism glasses.

**Equipment**- Watch hands carefully for muscle imbalance. You may want to use a short opponens. A lumbrical bar can be attached if needed.

**Your patient is in O. T., in bed, and has finger musculature.**

The program will be the same as for a patient on the ward, in bed, with functional finger musculature. Let's look at that program.

**Your patient is in a wheel chair, on ward, and has finger function.**

He should be able to come to O. T., so check. If he cannot, the program will be the same as for a patient in a wheel chair, in O. T., with functional musculature. Let's look at that program.

Your patient is in a wheel chair, in O. T., and has finger function.

**Activities** - Your patient should do well sitting and when he reaches 70° can do any activity he wants. Activities should be planned for the proper resistance to build up the hand muscles in a coordinated manner. Watch for substitutions and if the patient is within three months from injury, prevent all substitutions. After three months, if re-innervation of musculature has plateaued you might as well let the patient do activities the best way he can.

**Exercises**- Progressive resistive exercise to hand muscles should be a part of your program. Watch especially the intrinsic function.

**ADL** - Your patient can do all ADL with little difficulty. Again, discourage patients who are early post-injury from using substitute motions.

**Equipment**- Will need to be measured for a wheel chair following prognosis conference. Also, a seat cushion and possibly a lapboard if he wants one. Don't forget the skin check mirror.

\*Do you have questions concerning a progressive sitting program?

Yes      No

[ If answer is yes, program will review progressive sitting section. ]

Hopefully, your patient will have an incomplete lesion and will get return of function. Even if he does not, he should get stronger in what he has. Always be watching for some new function, even if only a poor level, in the group of muscles at the next innervation level. A poor muscle can be a help with the proper orthotic equipment. Perhaps a trace motion can be strengthened to a poor one. You want to progress your program rapidly but with care that you are starting your patient off properly.

## VII. Discharge Planning

When planning your discharge, keep in mind the family situation, where the patient will live, and what he will be doing. Make your home instructions meaningful to the patient, and to the family. Instruct the patient thoroughly, as he should assume maximum responsibility for his care.

Two weeks before discharge, check all the equipment and make sure it is received and is functioning properly. If the patient has not received his wheel chair, get him a loan chair to use until his comes.

Have your home instructions ready several days before discharge. When you go over them with the family, have them give you a return demonstration for any complicated activity. Be sure your list of equipment received and on order is correct.

Write your discharge summary as soon as possible, as it gets harder to remember the longer you wait. Try very hard to put in all important information. You probably will not be here when the patient comes back, so it makes it very important for you to record all the information which will be helpful on re-evaluation.

Good luck with all your spinal cord injured patients, and may your contribution toward their rehabilitation be significant.

THE END

## APPENDIX B

### Rating Scale for Evaluation and Program Planning

The following is a subjective rating scale of your perception of the method you used for the evaluation and program planning for spinal cord injured patients.

It is hoped that you will feel you have progressed during this affiliation. Remembering back to your first evaluation, mark that point on the scale and draw an arrowed line to where you feel you have progressed.

I am trying to evaluate the process used for evaluation and program planning, not evaluate you. Please try to give your true feeling, not what you think we expect from you. This will have nothing to do with your evaluation; it is only for my use in my attempt to establish a better method for evaluation and program planning. Thank you very much for your assistance.

<u>Evaluation</u>	very much	very little
1. Confidence in approaching patient		
2. Confidence in evaluation of patient		
3. Knowledge in what to look for		
4. Knowledge in how to look		
5. Skill in writing evaluation		
6. Speed with which necessary information was obtained		
7. Independent judgment with little assistance from supervisor		
<u>Program Planning</u>		
8. Confidence in planning program		



very much

very little

9. Confidence in carrying out program \_\_\_\_\_
10. Independent planning with few  
suggestions needed from  
supervisor \_\_\_\_\_
11. Proficiency in establishing short-  
term goals \_\_\_\_\_
12. Proficiency in establishing long-  
term goals \_\_\_\_\_

## APPENDIX C

Averaging the behaviors displayed by the students participating in each group, it appeared that with the computer method:

1. The aggressiveness with which the students pursued the initial evaluations was
2. The speed with which the initial evaluations were completed was
3. The quality of the initial evaluation was
4. The ability of the students to establish goals without needing suggestions was
5. The aggressiveness with which the students established their programs was
6. The progressiveness with which the students advanced the programs was
7. The speed with which the students established their programs was
8. The time available for observation was
9. The programs were student initiated and showed independent judgments

more	same	less
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