To the Graduate Council:

I am submitting herewith a dissertation written by John Charles Turner entitled "The Development of Medical Standards for the Assessment of Back Disability in a Nursing Population." I have examined the final copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Education.

James J. Neutens, Major Professor

We have read this dissertation
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THE DEVELOPMENT OF MEDICAL STANDARDS FOR THE ASSESSMENT OF BACK DISABILITY IN A NURSING POPULATION

A Dissertation

Presented for the

Doctor of Philosophy

Degree

The University of Tennessee, Knoxville

John Charles Turner

December 1989

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DEDICATION

This study is dedicated to my mother, Grace Turner, who, at the age of 73 in 1987, became the second member of our family to graduate from university. Her sacrifices and life experiences have taught me the necessity for work and the value of education. Her dignity, integrity, strength and love, have demonstrated to me how much I have left to learn. She has succeeded as a mother.

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ABSTRACT

The purpose of this study was to develop a job-specific abilities analysis for nurses, and to compile medical standards for disability assessment based upon abilities analysis, appropriate for The University of Tennessee Medical Center at Knoxville. The primary area of interest for this research was back disability.

A group of 226 staff nurses at the Medical Center completed a survey of six physical ability scales developed to assess the greatest amount of physical stress experienced by them in their daily duties. In addition, a group of 24 physicians and physical therapists completed a survey designed to rate the maximum allowable physical stress for each of the same six physical ability scales.

A statistical analysis of the findings of this investigation led to the following conclusions:

1. A task-oriented abilities analysis profile of the physical stress experienced by nurses in six physical ability areas was produced for The University of Tennessee Medical Center.

2. An abilities-specific, medical standards profile for back problems, covering six physical ability areas, was produced for this institution.

3. Supervisory personnel are able to assess the

physical stresses required of nurses in their jobs on an equal level with the line personnel.

4. General practitioners and physical therapists were not found to assess allowable physical stress on an equal level with orthopedic and neurologic surgeons.

5. There is a need for educational and behavioral programs in the areas of obesity and care of the lower back in this nursing population.

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CHAPTER I

INTRODUCTION

> In 1899 the lower house of the Indiana Legislature finally stepped in where effete academics had been pussyfooting around for centuries: the Hoosiers passed a bill setting the value of pi exactly equal to four (Shodel, 1981, pg. 26).

The concept of standardization, and the development of standards appropriate to a given situation, are problem areas which are increasingly bringing the medical professional into a partnership arrangement with the workplace. One of the more difficult tasks a physician is called on to perform in the exercise of medical practice is the assessment of disability and ability of persons in relation to their job situation (Greenwood, 1984, p. 595). The allegiances of traditional medical practice, where only the perspective of the patient was attended to, have evolved to include a consideration of the employer's circumstance, in the area of job suitability. This expansion of address, whereby the physician takes on the role of gatekeeper in regards to individual employability, brings with it attendant social, ethical and moral problems (Stone, 1979). These additional concerns complicate further the already difficult task of assessing specific health status.

A confounding variable in the interplay of forces which

attempts to resolve this ability/disability question, is the particular bent medical practitioners are imbued with in their training, equating illness with disease (Helman, 1984, p. 65-69). As many authors have noted: disease is the physical state of the individual, while illness is the experience of the disease (Balog, 1982, p. 10, Chrisman, 1985, p. 8). The physician's tendency to extrapolate from the disease state to the illness situation is an example of the medical profession's proclivity to "generalize their expertise beyond technical matters" (Crawford, 1980, p. 369). In the present context, this manifests itself as a belief that if the disease is known, then the illness is predictable (Hadler, 1984b, p. 47). Illness, in respect of employability, is the experience of work incapacity (Hadler, 1986, p. 941; 1984b, p. 49). It is when the medical practitioner moves away from the strictly scientific constraints of disease assessment, and into the culturally defined domain of illness, that variance occurs.

From a semantic point of view, disease and illness, when defined within the context of employment assessment, take on the labels of impairment and disability. Impairment implies the strict physiological disease state of the individual, while disability refers to the social and legal implications of that impairment (Pace, et al., 1986, p. 584; Stone, 1979, p. 230). Medical training, while preparing the physician to perform an excellent job of assessing

impairment, virtually ignores the area of disability evaluation (Hadler, 1984a, p. 592; Ziporyn, 1983, p. 874). Even more troubling, is the realization that ability assessment has even a lower priority than disability appraisal (Hanman, 1959, p. 595). Despite this lack of preparation, social custom and professional inclination have combined to confer the role of disability evaluation upon physicians (Ziporyn, 1983, p. 873).

In an attempt to assist in this situation, two problem areas in the assessment of job ability and disability will be addressed in the present study. The first concerns an adequate job analysis, while the second deals with medical standards for workers in relation to the job requirements. The underlying rationale for assessing the balance between disability and ability issues was suggested by Hanman twenty years ago. "The great mass of humanity is concurrently both partially fit and partially unfit to meet the challenges of the outside world" (1959, p. 596). Stereotyping and blanket generalizations limit human potential and endeavor, frequently resulting in adverse circumstances. The primary reason for the physician to evaluate the demands placed upon the employee is to best match the individual with the job (Mitchell, 1985, p. 2; Strasser, 1979, p. 23). A secondary reason, one that is frequently overlooked, is to provide an opportunity for a health needs assessment in a population which may be placing itself at risk due to

personal behavior choices (Walsh, 1986, p. 789; U.S. DHEW, 1979).

A. PROBLEM STATEMENT

The problems addressed in this study were to develop a job-specific abilities analysis for nurses, and to compile medical standards for disability assessment based on the abilities analysis, relevant to The University of Tennessee Medical Center at Knoxville.

B. RESEARCH QUESTIONS

The following research questions were addressed in this study.

1. Can a task-oriented abilities analysis profile be produced for the Department of Nursing Services at the University of Tennessee Medical Center at Knoxville?

2. Can an abilities-specific, medical standards profile for back problems be produced for this department?

3. Is there a significant difference between the abilities scale ratings of nursing supervisors and staff nurses?

4. Is there a significant difference between the medical standards ratings of a group of orthopedic and neurosurgical physicians, a group of general practice

physicians, and a group of physical therapists?

C. ASSUMPTIONS

The basic assumption made regarding this study was that all individuals responded truthfully and to the best of their ability.

D. DELIMITATIONS OF THE STUDY

For purposes of this study the following delimitations were made.

1. Only nurses employed within the University of Tennessee Medical Center of Knoxville were used in the study.

2. Only health care professionals who carry on the practice of their profession within the city of Knoxville were used as assessors in the study.

E. LIMITATIONS

For purposes of this study the following limitations were allowed.

1. Due to content constraints, the entire nursing population of the University of Tennessee Medical Center was surveyed. A random sample was not attempted.

2. Due to content constraints, and time factors, a random sample of University of Tennessee at Knoxville health professionals was not attempted, volunteers were utilized.

3. Scale assessments for the staff nurses were limited to the instructions included with the scale packets, since individual instruction was not possible.

4. It was not possible to control for political and employment pressures which may have influenced the responses.

F. DEFINITION OF TERMS

Abilities. Are "general traits of the individual which provide him with the capacity to perform different tasks" (Levine, et al., 1973, p. 150).

Disability. Is an administrative assessment referring to the "incapacity of an individual to meet certain standards of physical efficacy and/or social, occupational or economic responsibility" (Carey and Hadler, 1986, p. 706,). It should be noted that different organizations use differing definitions of disability. For example, the Social Security Administration's definition of disability states: "the inability to engage in any substantial gainful activity by reason of any medically determinable physical or mental impairment which can be expected to result in

death or has lasted or can be expected to last for a continuous period of not less than 12 months" (US DHHS, 1986, p. 8).

General practitioner. For the purposes of this study, a general practitioner is a physician practicing in the areas of family medicine, internal medicine, emergency medicine or occupational medicine.

Handicapped person. Is "an individual who: has a physical or mental impairment that substantially interferes with any major activity; or has a record of such an impairment; or is thought of as having such an impairment whether or not he or she actually does" (Stillman, 1979, p. 602).

Health care professional. A member of a profession providing health care or knowledgeable in a health-related field, including: physicians, nurses, physical therapists, occupational therapists, exercise physiologists and industrial hygienists.

Impairment. Is a determination usually made by a physician of "a physical or mental limitation in function resulting from a disease process" (Carey and Hadler, 1986, p. 706).

Job analysis. Is "the scientific study and statement of all the facts about a job which reveal its content and the modifying factors which surround it" (Gael, 1988, p.

303).

Nursing supervisor. Is a nurse working within the authority of The University of Tennessee Medical Center and whose job title may be found within the following list: nursing supervisor, nurse manager, head nurse, director of nursing.

Preplacement examination. An examination performed by a licensed physician prior to employment, "for the express purpose of determining and recording the physical condition of the prospective worker and assignment to a suitable job in which his disabilities, if any, will not affect his personal efficiency, safety, and health, nor the safety of others" (Schussler, et al., 1975, p. 254).

Staff nurse. Is a nurse working within the authority of The University of Tennessee Medical Center in any of the specialty areas, who delivers direct patient care and is not considered as occupying a supervisory position.

Subject Matter Experts. Individuals with intimate knowledge of a particular job or area of human performance, and may be analysts, supervisors or incumbents.

Task. Is "a discrete organized unit of work, with a definite beginning and end, performed by an individual to accomplish the goals of a job" (Gael, 1983, p. 9).

Worker's compensation. Is a state-based "no-fault insurance system for work related accidents...to compensate

a worker for wages lost as a result of injury on the job" (Carey and Hadler, 1986, p. 708).

G. NEED FOR THE STUDY

During the decade 1966 - 1976, disability of all types increased, with the prevalence rate for long-term disability escalating by 25 %, from 1,148 to 1,433 cases per 10,000 individuals (Colvez, 1981, p. 466). Health benefit expenditures by employers have increased by as much as 40 % a year, far outstripping other costs of production (Walsh, 1986, p. 790). The mismatching of physical abilities with job demands, increases workers' risk of injury (Keyserling et al., 1980, p. 333; Reilly et al., 1979, p. 262). As society's legitimizers of illness, physicians are being called upon to quantify disability and impairment, as well as ability, in an attempt to curtail these costs (Hadler, 1984b, p. 49). The lack of academic preparation handicaps medical practitioners, forcing them to rely on their own personal experience (Ziporyn, 1983, p. 874). Further, most disability assessments are performed by physicians on the basis of a single visit, and over half of the practitioners polled in one study felt it was almost impossible to determine true levels of impairment after such a brief encounter (Carey, et al., 1987, p. 270). The incidence of

litigation in the area of worker assessment is also looming into view as an additional pressure on the physician's evaluation (Barken and Markowitz, 1988, p. 405; Billauer, 1985, p. 185; Ziporyn, 1983, p. 874). Of major importance in disability assessment, is the appropriateness of the medical assessment to the job requirements (Hogan and Bernacki, 1981, p. 470). Fleishman (1982, p. 831) notes that "medical screening is often done without clear enough information about job tasks and requirements". Hadler is very blunt in his assessment of the importance of this point. "Data suggest that no disease measure, no quantification of impairment, will predict disability as accurately as descriptions of the demands of the patient's job" (1986, p. 943). Polakoff and O'Rourke (1988, p. 52) refer to the existing health standards used for pre-employment evaluation and placement, as obsolete. It is apparent that physicians, in their day to day evaluations of employment suitability of workers, could benefit from increased awareness of the job situation, as well as from appraisal standards, formulated through expert review. This aspect, however, is very poorly represented in the literature available to a physician practicing in Tennessee. Despite several groups across the United States actively researching this problem, most of the data and methodology remains in the private sector, unavailable except on a fee-

for-usage basis. The need exists for a public, accessible, methodological analysis and valid medical standards. The result of this methodology would be a medical standards instrument which would help the physician make appropriate recommendations regarding disability, since it would relate the degree of impairment to the specific job requirements. This type of relationship should offer distinct advantages to all parties involved. For the employer, a more reliable assessment would help ensure that his or her employee was capable of performing the duties of the job, with less fear of future injury or litigation. It could act as a basis for decreasing worker's compensation insurance costs, lowering health care premiums, and avoiding decreased profits resulting from poor performance and lost time. For the employee, it could offer a measure of protection against injury or, importantly, loss of employment. If a degree of impairment is likely to result in future injury, the employee could more safely be utilized in another area. Conversely, if the degree of impairment was assessed to fall within the limits of the medical standards, workers might be allowed to perform their duties despite a measure of symptomatology. Here we are focusing on ability instead of just disability. Further, a more accurate assessment of the individual in relation to his or her work environment may open the doors to health education and health promotion

activities. The physician is obtaining information concerning impact of disease, thus giving a greater insight into the dimensions of the person beyond the purely physical. Finally, for the physician, this type of medical standard would offer many benefits. It would allow for more accurate decisions regarding employability. It would lessen the possibility of litigation, as recommendations to the employer would be based upon reference to a statistical standard, in addition to his or her own assessment. It might also make the physician's evaluation more objective and possibly blunt any shadow of bias or discrimination. It would dramatically decrease the stress, cost and time of actual job-specific physical testing (Hogan and Fleishman, 1979, p. 200). Lastly, this type of medical standards instrument, if available to the general practitioner, may increase the likelihood of patients bringing their workplace problems into the office, if the physician is perceived as being knowledgeable in the occupational arena. The instrument would be intended to to act as an adjunct in the process of matching the worker with the most appropriate employment situation.

CHAPTER II

REVIEW OF THE LITERATURE

This chapter reviews the literature relevant to this study, including the writings of the major theoretical researchers in the field. To both physicians and employers alike, the most important use to which this type of information could be applied would be in the areas of the physical assessment of new employees and in the evaluation of employee disability. Part A, therefore, deals with the problem of preplacement examinations, while Part B addresses the area of disability, including the following: definition, assessment, impact and insurance. Part C offers an overview of the legal constraints placed on this type of assessment, and includes discussions of federal legislation, tort law and labor arbitration. It highlights the various pitfalls which can occur in this field. Part D is an introduction to the entire domain of physical abilities analysis, and includes the following: job analysis, abilities analysis, validity of the approach, medical standards development and criticisms of past studies. Finally, Part E discusses research on scaling techniques.

A. PREPLACEMENT EXAMINATIONS

The preplacement examination is a relatively new concept in the field of occupational health in America. It is a product of legal and legislative precedent which has altered the focus of the process (Nylander and Carmean, 1987, Vol. I). Traditionally, it has evolved from the preemployment examinations of children in England in the mid-nineteenth century (Rothstein, 1984, p. 16). This was at first a type of social reform designed to protect the younger workers who were being condemned to labor in the factories before they had even reached their thirteenth birthday. In the United States, during the early part of the twentieth century, legislation enacting the first workman's compensation laws, stimulated the beginnings of widespread preemployment examinations (Schussler, et al., 1975, p. 254). The motivation for this first attempt at worker assessment was anything but altruistic. As Everly and Feldman have noted, the major function of the company physician and his or her exam, was to "minimize the legal culpability of the company to compensation claims and other litigation" (Everly and Feldman, 1985, p. 28). This tended to be the form of the preemployment examination for many years, despite authoritative statements such as the following by the American Medical Association, which appears to support a

less one-sided purpose.

> Preemployment examinations are made for the express purpose of determining and recording the physical condition of the prospective worker and assignment to a suitable job in which his disabilities, if any, will not affect his personal efficiency, safety, and health, nor the safety of others (AMA, 1956, p. 976).

Theoretically, this was the applied doctrine, however, as Felton noted in 1972, this probably was not the case. "The examination...has been used to keep certain applicants out of employment" (Felton, 1972, p. 193). The examination was being performed to discover abnormality, which was equated with disability, and consequently unemployability. Ability, or what an individual could do, was not evaluated in the protectionist atmosphere of preemployment examinations. The Rehabilitation Act of 1973, followed by the Uniform Guidelines for Employment Selection Procedures of 1978, have changed dramatically the thrust of this process (Hogan and Bernacki, 1981, p. 469).

As a result of this legislation and the subsequent litigation which followed, Strasser was able to state in 1979 that: "since the intent of the preplacement examination is proper placement and a baseline medical examination, rather than a medical rejection, the old term of preemployment examination is now considered outdated" (Strasser, 1979, p. 23). Now ability, rather than disability, would receive the emphasis in this type of examination. Goldman proposed three major goals of the

preplacement exam.

> In general, the primary goal of the PPE is to reveal any medical condition that might put the worker at an increased risk to himself or others as a result of certain job exposures or activities, so that an appropriate placement or accommodation can be made. Another important goal of the PPE is to provide a baseline for future testing to assess the impact of subsequent exposures (toxins or physical stresses) or the development of pathological conditions.Other optional goals chosen in some settings are the provision of recommended primary care periodic health tests (aimed at early recognition of treatable non-occupational diseases such as hypertension or breast cancer) and/or health promotional activities (Goldman, 1986, p. 967).

Not initially evident in the above statement is a mechanism for application of the results of the preplacement examination (PPE), and of the attendant control over actual employment which this provides. This area has been the source of some controversy. One belief holds that the physician, backed with an adequate job analysis and strict guidelines from the employer, should have authority to accept or deny employment (Lerner, 1981, p. 475). The predominant view, however, holds that the physician functions only in an advisory capacity. The actual determination of employability and disability is an administrative decision performed by employers, adjudicators, judges, claims adjusters and job analysis experts (Lomas and Berman, 1983, p. 241; Hogan and Bernacki, 1981, p. 470). This is a reasonable process, since the scientific evidence for predicting susceptibility to an

occupational health hazard is not available in most cases (Kelman, 1985, p. 1232). Given the weight that the physician's opinion holds, the above comment demonstrates the need for improved medical evaluation techniques.

In regards to effectiveness of the PPE, the literature does not support the use of this type of examination for jobs which are not physically demanding (Alexander, et al., 1977, p. 112; 1975, p. 692). However, the literature does support the use of an assessment of physical ability for physically demanding jobs (Campion, 1983, p. 527; Chaffin, et al., 1978, p. 403). This assessment involves more than a traditional screening type of exam, as Campion has noted.

> Preemployment medical evaluations used alone are inadequate for personnel selection for physically demanding jobs. Although they are useful for detecting preexisting ailments that may create excessive health risks on the job, they have not been shown to reduce the incidence of lower-back injuries (Campion, 1983, p. 528).

This comment is supported indirectly by a study performed by the Tennessee State Employee Health Service. This investigation concluded that a health history was the most productive tool in screening for health risks in an employed population. A physical assessment was not felt to be a valid predictor (Harris, et al., 1986, p. 222-224). These results are open to question, however. Physical assessment was only cursory at best, described as "a general physical assessment by the registered nurse". The remainder

of the exam consisted of a health history, electrocardiogram and laboratory studies. There was no attempt to assess physical capacity in relation to job requirements. If one is only screening for disease processes, presumably this investigation is valid. However, the assessment of health risks in the workplace is incomplete if physical stresses and their effects on the individual workers are not included. There is room for compromise in the area of workplace health assessment, as objectives and goals of each type of appraisal must be weighed. In respect of this present study, the PPE should be job-specific, and not considered a complete examination of the health of an employee (Flight and Schussler, 1976, p. 231).

A review of research on hospital personnel reveals that the PPE has been used almost exclusively for assessing the medical, as opposed to physical, health of the employee. Results of these studies demonstrate vulnerability to communicable diseases, but does not assess susceptibility to musculoskeletal injury (Lowenthal, 1986, p. 452; Lewy, 1985, p. 124; Schneider and Dykan, 1978, p. 743). This neglect of a specific investigation of the physical status of hospital personnel seems to be at odds with the actual incidence of injury. At the University of Tennessee Medical Center, during 1988, 806 worker's compensation accidents occurred. Of these, 43 % were accounted for by the nursing

service. Further, of the worker's compensation injuries within the nursing service, 18.4 % were of musculoskeletal origin (Fields, 1989).

B. DISABILITY

Concepts. The concept of disability is one which is colored by the particular perspective of the individual. It is tied inextricably to attitudes and beliefs about health. It might be that disability is a more precise definition of health, if one is able to appreciate that describing what an idea is not, helps to make clear what it is.

> Disability rather than morbidity per se will increasingly come to define health status and be the subject of public policy. Whatever the biological limit turns out to be with regard to the life span, the future emphasis will be on the quality of life attainable. Minimal disability will be the goal. Health will be defined in terms of effective functioning (Pope, 1984, p. 592).

This attitude portrays a social rather than a physiologic conceptualization of disability. Disability appears to have two perspectives. One view is that of the individual, and refers to the experience of loss of ability or capacity. This would be equivalent to the concept of illness, which increasingly is regarded as the experience of disease (Chrisman, 1985, p.8). The second view would be that of society in general, where disability is judged from

the perspective of role dysfunction. This would be akin to Parson's sick role behavior, whereby our culture legitimizes a particular fashion of behavior based upon a label of sickness (Parsons, 1951). The route society uses to arrive at a conceptualization of illness or disability is that of the biomedical view of health. By this approach, disease, or in the realm of the workplace, impairment, is ascertained by a scientific, physiologically based assessment. However, just as there is a difference between disease and illness, there is a difference between impairment and disability. The following statement may help to clarify this somewhat.

> Diseases and illness are...distinct phenomena. Disease is a category applied to a variety of biological events such as changes in physiological, biochemical, or anatomical structure and functioning. As biophysical states these events exist independently of human knowledge and evaluation. By contrast, illness is a social state created by human evaluation; it is a symbolic ordering of given events or states of affairs by the application of a label. Consequently, it is not an entity but a meaning used to explain, organize, and evaluate these events or states of affairs (Locker, 1981, p. 4).

Physicians, trained in the biomedical model of health, have a tendency to equate disease with illness (Helman, 1984, p. 65-69). Their reductionist tradition makes the assumption that "the whole can be understood by reconstructing the parts" (Shaver, 1985, p. 186). This interprets into the view that "if you have a particular disease of sufficient magnitude, the resulting illness is predictable including the way in which the illness will

operate in the workplace" (Hadler, 1984b, p. 47). The operative descriptor for illness in the workplace is disability.

Just as disease is the physiologic basis for illness, so impairment is the basis for disability. Impairment is strictly a medical term, indicating "any anatomic or functional abnormality or loss" (Ziporyn, 1983, p. 874). The Social Security Administration defines impairment as that which has "medically demonstrable anatomical, physiological, or psychological abnormalities...as signs or laboratory findings apart from symptoms" (US DHHS, 1986, p. 1). Further, the evaluation must be based on clinical and laboratory diagnostic techniques. The individual's "own description of his impairment is insufficient" (Mooney, 1987, p. 14). Therefore, in the evaluation of impairment, a clinician is required. Once an impairment has been determined, the individual receives a label from the practitioner which legitimizes the sick role, or disability role (Walsh, 1986, p. 792). Once credibility has been conferred, then the illness/disability which the individual perceives, becomes the societal role of disability. Now the legal connotations of disability come into play (Pace, et al., 1986, p. 584; Ziporyn, 1983, p. 873; Hadler, 1982, p. 668). One promising note in the assessment of disability is the recognition among agencies requiring this type of

assessment, that "a reexamination of the need to voice and anchor disability in terms of the quantity of physical impairment" is in order (Hadler, 1986b, p. 1411).

Assessment. In the act of proclaiming the existence of an impairment, physicians function as "gatekeepers" in the societal construct known as disability (Crawford, 1980, p. 369; Stone, 1979, p. 227). While perhaps not making the specific decision regarding disability, physicians provide the evidence for such a determination. Thus, one author has referred to physicians in their role as certifiers, as "street-level bureaucrats," providing data for administrative purposes (Stone, 1979, p. 235). Despite the theoretical recognition of the medical practitioner's role, they are frequently asked to make an assessment concerning the degree of disability of the person under question (Ziporyn, 1983, p. 874). In response to this the American Medical Association has made the following statement.

> The principle use of a medical rating of permanent impairment is in a nonmedical setting, and it is important to distinguish between conclusions and recommendations of a medical nature for which the physician is responsible, and those of a nonmedical nature that have social, administrative, economic, and legal consequences beyond the domain of medicine (AMA, 1984, p. vii).

In addition to this admonition, disability assessment or work capacity illness is largely ignored in the training of most physicians (Sokas and Cloeren, 1987, p. 414; Mooney,

1987, p. 22; Hadler, 1986a, p. 940; Hadler, 1984b, p. 49; Ziporyn, 1983, p.874). Further, much of the clinical measurements performed by physicians "lack any clear relationship with actual residual functional capabilities to perform work tasks or activities of daily living" (Greenwood, 1984, p. 595). And to provide one more confounding variable into the assessment of disability, physician characteristics and patterns of behavior also influence this determination. In a clinical practice which must be akin to the fear of making a statistical Type II error;

> Physicians in clinical practice, when faced with diagnostic uncertainty, tend to use an implicit decision rule that it is better to make an error by classifying a person as sick when he is really healthy than to classify him as healthy when he is really sick (Stone, 1979, p. 240).

Given the above concerns, coupled with the recognition that physicians will continue to be asked to assess disability, the need for a disability assessment tool is obvious. "Both physicians and administrators could be helped in their decisions by systematic research on how different clinical diagnoses translate into actual disability" (Stone, 1979,p. 252). The Social Security Administration has incorporated into their assessment a measure of functional residual capacity in an attempt to quantify ability (Ettinger, 1987, p. 278). This estimate however, is open to some question. "Neither the reliability

...nor the validity...of the deductive process represented by the functional residual capacity has been formally tested" (Carey and Hadler, 1986, p. 708).

Impact. Disability of all types appears to be increasing in the United States. Between the years 1966 and 1976, the prevalence rate of long-term disability increased by 25 %, from 1,148 to 1,433 cases per 10,000 persons, while the short-term disability increased by 15 % (Colvez and Blanchet, 1981, p. 466). One review noted that for the twenty year period ending in 1984, the prevalence rate of work disability has risen by 25 % in the prime working ages, and by 40 % in the age group 45 to 64 years (Chirikos and Nestel, 1984, p. 117). From 1968 to 1978, the cost of the Social Security Disability Insurance program increased by almost 500 %, from $2.1 billion to $12.5 billion (Wolfe, 1984, p. 188). In 1986, it was estimated that out of the entire $25 billion budget of the Social Security and Supplemental Security Income Disability programs, greater than $225 million would have been spent for medical evidence of disability alone (Pace, et al., 1986, p. 584). In reference to worker's compensation, in 1984, the cost to American employers was in excess of $25 billion (Worrall and Appel, 1985, p. 1). A factor which may be involved in the increased numbers and cost of disability is the increased

quality of disability insurance. One study has suggested that "disability insurance programs contributed to the increase in the aggregate rates of work disability over the past twenty years" (Chirikos and Nestel, 1984, p. 129).

Of all the causes of restricted activity in the United States, musculoskeletal conditions are the most common. They "rank first in terms of people reporting that they are unable to work because of activity limitation" (Yelin, et al., 1986, p. 1323). Each year physicians are asked to perform approximately 1.2 million assessments of patients with musculoskeletal problems, for Social Security Disability Insurance, Supplemental Security Income, Veterans Administration benefits, Worker's Compensation, and private disability insurance (Yelin, et al., 1986, p. 1322).

At the University of Tennessee Medical Center, costs for worker's compensation have increased by 116.8 % between 1987 and 1988 (Fields, 1989). While only approximately 15 % of the worker's compensation cases were of musculoskeletal origin in the nursing service, they comprise a disproportionate share of the total cost.

Insurance. The two primary insurance plans in the United States covering worker's disability, excluding private insurance, are the Social Security disability program and worker's compensation. The federal plans, Social Security

Disability Insurance and Supplemental Security Income, are based on an insurance model of work disability (Carey and Hadler, 1986, p. 706). Each worker contributes to the plan through a system of taxes, and receives benefits if they meet specific criteria of disability. This system was established in 1956 and is designed to assist persons who are not able to earn $300 per month secondary to work incapacity (Hadler, 1986a, p. 942). Any worker is therefore insured against poverty due to the inability to work. Under both federal programs, disability is defined as "the inability to engage in any substantial gainful activity by reason of any medically determinable physical or mental impairment which can be expected to result in death or has lasted or can be expected to last for a continuous period of not less than 12 months" (US DHHS, 1986, p. 1). A definite distinction is made between disability and impairment by the Social Security Administration in an attempt to equalize assessments. Impairment refers to a "physical or mental limitation in function that results from a disease process" (Carey, et al., 1987, p. 268), and manifests itself "as signs or laboratory findings apart from symptoms" (US DHHS, 1986, p. 1). The physician is not asked to give an opinion on the individual's ability to do work, only a quantification of impairment. They are, however, asked to make an assessment of the person's functional

residual capacity (Ettinger, 1987, p. 277). This in reality does involve making a somewhat subjective appraisal, and as noted above is open to questions regarding reliability (Carey and Hadler, 1986, p. 708). Work capacity is really not measured, rather the impairment is matched to a comprehensive "schedule" of approved pathoanatomical derangements, which if present qualifies the individual for benefits.

Worker's Compensation is a State-run, no-fault insurance plan, designed to insure workers against wage loss due to injury or disease resulting from employment. This program deals with a range of disability, from permanent total disability to temporary disability, unlike the Social Security plans which only cover long-term disability (Greenwood, 1984, p.596). Two factors are involved in the assessment process for this type of reparation. First, the specific relation to work of the injury must be proven, and second, residual work incapacity must be demonstrated (Hadler, 1986a, p. 941). In most cases, with complete recovery, this operation proceeds smoothly. However, when recovery is not complete, the degree of work incapacity must be determined. Recognizing the difficulty of this task, the specific injury or degree of impairment is generally used to assess compensation. The implications of this reasoning being: "if workers have sufficient damage, they ought to

experience symptoms (illness), and sufficient illness should manifest itself as the illness of work incapacity" (Hadler, 1986a, p. 941). A commonly used source of reference for this assessment, the Guides to the Evaluation of a Permanent Impairment (AMA, 1984), primarily equates capacity with function. Again, disability is assumed to follow from a quantification of impairment.

Worker's compensation laws were originally enacted to protect both employers and employees from tort law action. In reality, however, this system exists in an adversarial atmosphere with about 20 % of claims being litigated (Greenwood, 1984, p. 597).

C. LEGAL CONSTRAINTS

The legal issues which arise from ability assessment differ depending on which perspective the evaluation is being viewed from. Disability assessments for the Social Security plans or Worker's Compensation programs function under different stipulations than preplacement or job analysis estimations. Federal and state governed programs exist under strict guidelines, while preplacement assessments depend on legal precedent for direction. From a medical practitioner's point of view, worker's compensation and Social Security programs ensure a more

comfortable role, in that each plan has very specific procedural guidelines indicating what is required, and what path is open for appeal. Social Security, for example, has formulated a cascade of application and appeals processes (Carey and Hadler, 1986, p. 707; US DHHS, 1986). Control over benefit approval is in the hands of specific administrators who depend on medical assessments of impairment, not the opinion of the physician. There is little exposure, in a legal sense of the word, for practitioners, in that the decision making power does not lie with them (Hadler, 1986a, p. 943). In a recent ruling (Samuels v. Bowen, 1986), the court has opened the door somewhat for greater physician input into the Social Security Administration process. By the order in this case, physicians are allowed to make a statement concerning an individual's functional residual capacity, or more accurately, their ability. Still, practitioners are shielded from any direct predictions concerning disability.

In regards to Worker's Compensation, however, the picture changes somewhat. In this State-based program, an algorithm of procedures exists as with Social Security, but the physician's role is modified. Now the practitioner must make a statement concerning the causality of the impairment, as well as the degree of work incapacity, and length of disability (Carey and Hadler, 1986, p. 709; Hadler, 1986a,

p. 941). Legal exposure is increased dramatically, as the physician is requested to function as a "clairvoyant", unearthing the cause of an impairment and predicting its future. Hadler (1978, p. 998) feels physicians have no business attempting this type of evaluation, requesting they limit their assessments to the degree and nature of impairment. When an impairment is of a severe nature, precluding any gainful employment, this system differs little in relation to the Social Security plans. However, if the individual is still employable, or the nature of the problem is a transient one, the subjective aspect of the physician's assessment is called into play in addition to the purely objective. Originally, the worker's compensation program was designed to prevent tort action, in a compromise to protect both the employee and the employer. Recently, due to ever increasing monetary awards, individuals are pursuing recourse from the judicial system beyond that available through the statutory process (Billauer, 1985, p. 186). Once this route is chosen, the case typically becomes adversarial, which might require the physicians involved to defend their assessments in court. Disability assessment under Social Security may also necessitate physician testimony regarding assessment of impairment, but unlike worker's compensation, it does not require an additional evaluation of causation or length of disability (Barken and

Markowitz, 1988, p. 407-408). These authors go on to support the difficulty physicians have in fulfilling this requirement.

> Perhaps the most difficult task facing the physician in a medico-legal evaluation is the question of 'disability'. A person's degree of disability is not a provable fact, but rather an estimate based on the total effect of the injury on that individual's occupational and nonoccupational activities. The concept of disability is a legal device designed to provide equitable financial awards to injured persons and to determine whether an employee may safely return to work. Yet a person's incapacity to perform a job is largely a matter of job training and job assignment ...in evaluating disability, the physician relies on clinical findings of physiologic impairment. These findings may be clouded by the psychologic factors... and by the recognition that the patient's statements may be self-serving. Physicians' own attitudes toward the legal concept of disability awards, the specific illness, injury, and/or claimant will further affect their determinations. This subjective aspect of evaluating disability accounts for the wide range of estimates often presented by conflicting experts (Barken and Markowitz, 1988, p. 410).

More difficult, possibly, than these two types of disability assessments, is that of evaluating job suitability in a preplacement examination. This evaluation is fraught with difficulties from a legislative point of view for both the employer and the physician. What comes into play in this situation is the concept of discrimination and handicap. There are some very specific guidelines mandated by statute which provide a base for ability assessment in the workplace; however, most dictates have come in the form of legal precedent.

The Rehabilitation Act of 1973 is one of the primary

legislations which bear on this area. As stated in the act, and in subsequent decisions, a handicapped person is defined as an individual who;

> ...has a physical or mental impairment that substantially interferes with any major activity; or has a record of such an impairment; or is thought of as having such an impairment whether or not he or she actually does...to include: a person whose ability to communicate, move about or care for himself is impaired; a person recovered from a previous handicap, such as cancer, heart attack or mental illness; a person who suffers from epilepsy; an alcoholic; a drug addict; a person who is obese; and a person who suffers from an allergy (Stillman, 1979,p. 602).

By this rather loose definition, almost all persons with an impairment such that their work capacity is brought into question, could be considered as being handicapped. The Civil Rights Act of 1964 addresses the area of discrimination, with Title VII precluding "employment discrimination against individuals on the basis of race, color, religion, national origin, or sex" (Hogan and Quigley, 1986, p. 1193). In addressing these issues, no clear cut guidelines exist, leaving the employer and physician in a legalistic quandary. In general, for handicapped persons, the employer is not obligated to hire any person whose handicap renders them incapable of performing their job. The employer must, however, make reasonable accommodation for any degree of handicap, if it enables that worker to function in their job (Stillman, 1979, p. 603). As to what degree of accommodation is

required, that will depend upon the circumstances of each case. The risk of future injury is a common response to denial of a handicapped person, and has been addressed by the courts. "The risk of injury to the handicapped employee must be imminent and substantial if it is to justify denying employment" (Libbin et al., 1988, p. 40). Schlei and Grossman (1976, p. 1195-1196) have outlined several defenses to the charge of discrimination. The first, and most relevant to the present study, deals with the concept of job-related selection criteria. By this defense, an employer can apply a valid test to predict employee performance, given that the test was developed on the basis of professional standards. The second deals with the idea of business-necessity, whereby the selection is based upon an overriding business purpose, and no alternative practices exist. The third defense is the bona fide occupational qualification, which allows a specific classification based on a necessity for job performance. All three of these defenses relate to work assessment for persons of certain groups or persons with a handicap. As we have already seen, almost anyone with an documented or even supposed impairment could conceivably fall within these bounds.

The first listed defense, that of job-related selection criteria, impacts directly on the present study and finds

its origin in the specific wording of the Civil Rights Act of 1964.

> Nor shall it be an unlawful employment practice for an employer to give and to act upon the results of any professionally developed ability test provided that such test, its administration or action upon the results is not designated, intended or used to discriminate because of race, color, religion, sex or national origin (Hogan and Quigley, 1986, p. 1195).

This wording appears to open the door to abilities testing for job placement and suitability. The first case based on this principle (Griggs v. Duke Power Company, 1971), set the stage for the job-relatedness of selection procedures, and for the use of a job analysis in that process. The incorporation of a proper job analysis in selection practices became a necessity to establish content validity for the assessment tool. Job analysis was defined by the court as;

> ...a thorough survey of the relative importance of the job in question and the degree of competency required in regard to each skill. It is conducted by interviewing workers, supervisors, and administrators; consulting training manuals; and closely observing the actual performance of the job (Vulcan Society v. Civil Service Commission, 1973, p. 1237).

Two further cases expand the role and substance of the job analysis.

> The cornerstone in the construction of a content valid examination is the job analysis. Without such an analysis to single out the critical knowledge, skills and abilities required by the job, their importance relative to each other, and the level of proficiency demanded as to each attribute, a test

> constructor is aiming in the dark and can only hope to achieve job relatedness by blind luck (Kirkland v. Department of Correctional Services, 1974, p. 702).
>
> ...there must be a correlation between the importance of a job function as determined by the job analysis and the weight given to this function on the examination (U.S. v. City of Chicago, 1978).

Thompson and Thompson (1982, p. 872-873) summarized the court standards as of 1982 and noted several basic criteria. First, a valid job analysis was required. Second, appropriate sources for the job analysis must be used, to include: incumbents, supervisors, administrators, observations and questionnaires. The sample size should be large enough to truly represent the job in question. Third, tasks, duties and activities required in the job must be included in the analysis. The authors note the apparent necessity to include only the most important tasks on the selection tool. They indicate that the tasks included "must be critical and not peripherally related to job performance" (Thompson and Thompson, 1982, p. 867). Such a requirement was also noted by Kleiman and Faley (1985, p. 807). This last criterion, while accurately derived from the case law, causes some concern when viewed from the perspective of physical abilities. Many of the injuries incurred in the workplace, and which enter the jurisdiction of Worker's Compensation or the Social Security Disability programs, are a direct result of infrequent and relatively unimportant job activities (Johnston and Bischoff, 1987). It may be that

job selection practices which only assess the most frequent or most critical tasks, bypass those tasks which place the worker at most risk of impairment.

In 1985, the American Psychologic Association published the latest edition of the Standards for Educational and Psychological Testing. This publication has received support for its potential use during litigation dealing with validity questions of selection instruments (Kleiman and Faley, 1985, p. 829).

In 1986, Hogan and Quigley reviewed the existing case law concerning physical standards for employee selection. They recognized the weight which the courts have given to the Standards for Educational and Psychological Testing. The authors again note the necessity for an appropriate job analysis, and include a statement concerning the context of validation of the selection procedure. "Any method of job analysis may be used if it provides the information required for the specific validation strategy used" (Hogan and Quigley, 1986, p. 1200). The courts require an accurate listing of task information, qualified and experienced raters, and compatibility with the validation strategy used. Most of the cases reviewed by Hogan and Quigley involved the use of actual physical tests of applicants, and none were linked to medical standards. One case made reference to the selection of tasks used in the employee assessment process.

> That an occupational function consumes a de minimis proportion of one's workday...does not necessarily diminish the need for selecting one who can best perform that function (Hull v. Cason, 1978).

In 1982, the first case to use the physical abilities analysis method of employment selection was tried (Berkman v. City of New York). This case involved the use of Fleishman's physical abilities in the selection of firefighters for the city of New York. The justice found fault with the methodology used to calculate the abilities scales, and also with the lack of content validity to support this method for job selection. The case was settled in favor of the plaintiff, and a blow had been dealt the physical abilities methodology. On review of the specifics of the case, several factors at once come to light. First, the way in which the scales were tied to actual tasks which the firefighters performed, was very complicated and confusing. The scales were applied without an adequate job analysis being conducted, and the tasks were selected at the same time as the rating was performed. Second, much interference from the city officials hampered the application of the scales. Finally, the scales were used for weeding out applicants for the firefighters position, not in connection with any medical standards. In general the judge found fault with the implementation of the abilities analysis, not with the theoretical basis of the

method.

> To say that Dr. Fleishman's abilities analysis lacks content validity is, of course, not to criticize it as an unworkable job analysis device...there can be no question that it represents one reasonable approach to the subject (Berkman v. City of New York, 1982, p. 208).

Since the Berkman case there have been no recorded federal or state litigations involving the physical abilities analysis methodology. Of the private firms offering job analysis and medical standards using this technique, there have been several challenges, most being dropped prior to any formal appeal. Several labor arbitration hearings, one civil rights contest, and an Office of Revenue Sharing decision, against one company using the medical standards approach of the physical abilities analysis, have all been decided in favor of the abilities methodology (Occu-Med, 1987). In 1984, a labor arbitration hearing was held dealing with the employability of an individual with prior lumbar disc surgery who wished to return to work as a police officer (State of Hawaii Organization of Police Officers v. Honolulu Police Department, Department of Civil Service, City and County of Honolulu). The individual was not allowed to return to duty, as a result of a medical standards assessment, based upon the physical abilities methodology. The arbitrator's decision noted that less weight would be given to the grievant's personal physician and a consultant physician,

due to their lack of experience in establishing occupational standards (p. 48). The medical assessments of the grievant's physicians were never in question. What was challenged was the extrapolation of the individual's physical status to the job situation.

> The opinions...are valid when they state the Grievant is medically recovered. The Employer does not dispute that fact since they never challenge the Grievant's recovery. The Doctors, however, are not in a position to determine employability. The determination of employability is rightfully the employers (p. 48).

In this case, two qualified expert opinions were overruled in favor of a methodology which combined an appropriate job analysis, with a consensus medical standard. Since 1987, no judicial defeats have been experienced by this firm using the physical abilities technique of medical standards assessment (Bischoff, 1989). The only other major supplier of this technology reports no challenges whatsoever to their medical standards methodology (Miramon, 1989).

It would seem that in as far as the judicial system is concerned, the physical abilities analysis methodology is a reasonable one for use in employee selection, however in this context it must be tied to a valid job analysis. When it is used in conjunction with medical standards for disability assessment and job placement, it has received universal support.

One final note regarding liability for this type of

testing refers to both the employer and the physician. Employers who do not base their selection process on a valid testing program, leave themselves open for litigation.

> Of course, the law should not be designed to subsidize specialists. But employment testing is a task of sufficient difficulty to suggest that an employer dispenses with expert assistance at his peril (Berkman v. City of New York, 1982, p. 208).

Further, physicians who become involved in this type of medical examination expose themselves to possible suits from all sides, both from employers and employees. In one Tennessee case where an employee of a company had caused a motor vehicle accident secondary to his impairment, the physician was found negligent after a suit had been brought against the employer, who subsequently sued the certifying physician.

> ...several legal actions have been brought by individuals on the theory that an inaccurate medical assessment by a third-party physician resulted in financial or personal harm.
>
> ... the defendant physician was negligent in certifying the driver as physically fit...Tennessee Supreme Court held that the physician owed a duty to the driver's employer and that an action for indemnity would lie. It further held that a jury could find that the injuries sustained by the family were reasonably foreseeable as a result of the defendant's negligence. An even more intriguing issue raised by these facts is whether the injured family members could bring action against the physician for their injuries (Rothstein, 1984b, p. 546-548).

D. PHYSICAL ABILITIES ANALYSIS

Job analysis. From an intuitive and legal point of view, a valid job analysis is basic to any attempt at assessing employability (Libbin et al., 1988, p. 38; Hogan and Quigley, 1986, p. 1200; Bemis et al., 1983, p.8; Kirkland v. Department of Correctional Services, 1974, p. 700; Vulcan Society v. Civil Service Commission, 1973, p. 1236). "Although there are numerous formal job analytic techniques, there is no particular job analysis legally mandated as acceptable for all purposes" (Hogan and Bernacki, 1981, p. 470). Hogan and Quigley (1986, p. 1200) reviewed the literature and noted that: "any method of job analysis may be used if it provides the information required for the specific validation strategy used." The major requirement of this type of analysis is to ensure content validity. This is done by creating a bank of all tasks necessary to perform the job, as assessed by Subject Mater Experts (SME) and incumbents (Hogan and Bernacki, 1981, p. 470). Depending upon the reason for the job analysis, tasks may be rated according to importance, frequency, complexity and effort required. A general trend in both the published literature and in the courts is to use only those tasks most critical to the job or most frequently performed for the job analysis (Hogan and Quigley, 1986, p. 1201; Hogan and

Bernacki, 1981, p. 471; Jones and Prien, 1978, p. 35). This argument holds for general job employability, however it does not address the specific question of medical standards for future risk of impairment. Tasks which may not be crucial to job performance or required routinely might be a possible source of injury. Much of work-related injury is found to occur while the individual is performing a rarely needed function, which often times is not even recorded in traditional job descriptions (Johnston and Bischoff, 1987). It is these infrequent, high effort tasks which must be addressed in developing medical standards for employability. For if the most stressful task of a job is ignored in the job analysis, then medical criteria are meaningless. Norborg (1985) further supports the selection of tasks which may have significant bearing on injury in the workplace, yet may occur less frequently than the average task. In addition, Norborg reviewed the major methods of job analysis currently in existence, and makes the following statement.

> Fleishman's methodology remains the method of choice for evaluating the physical requirements of a job for the purpose of establishing pre-employment medical standards (Norborg, 1985).

For the purposes of this study, there exists a validated task analysis for the nursing profession. Lang (1988) reported the results of the Kentucky Nursing Delineation Study, which extensively reviewed the spectrum of nursing

tasks. A large expert jury was utilized, in addition to an in-depth survey of the literature. External consultants were employed to ensure content validity. Cluster analysis was performed on the task list, and separate groupings based upon sophistication of function were created. A complete listing of all the tasks included in the Kentucky Nursing Delineation Study is included as Appendix A.

Abilities analysis. Originally the abilities analysis methodology arose out of the area of learning theory as it applied to task dimensions (Fleishman, 1967, 350). The problem arose in trying to generalize the effect of some learning condition, on a given task, based upon its known effect on a prior task (Fleishman, 1972, p. 1017). Research has indicated the existence of several categories of human functions which impact on performance. Fleishman (1972, p. 1017) lists some of these categories: "identification, discrimination, sequence learning, motor skill, scanning, and problem solving." The difficulty of application becomes apparent when an attempt is made to utilize these concepts in actual measurement of human performance. Even more complex than mere assessment, would be the prediction of future skill levels. The incredible diversity of human functions which affect performance underscored the need for a new taxonomy of tasks which would allow for more specific

measurement and prediction (Fleishman, 1975, p. 1127). There had been no success at developing a "general theory of learning which allows dependable generalizations of learning principles to particular classes of tasks" (p. 1128). To this end, Fleishman began to develop a listing of human abilities which could be used to describe individual tasks. It was his theory that human tasks could be broken down into a specific number of abilities, which he envisioned as general capacities of individuals (Fleishman, 1978, p. 1009). Even though tasks may differ, their underlying abilities would be ascertainable. Each task would be a specific combination of different abilities (Mallamad et al., 1980, p. 57). Certain tasks would require only one ability, while others would include several. The pragmatic application of this research concerning this current study was to develop "a method for predicting job ability requirements which shortcut the process of studying each situation empirically, with little generalization across cases" (Fleishman, 1978, p. 1017). It has been noted that when SMEs attempt to assess specific jobs in respect to particular traits required to perform the job there is a singular lack of agreement, presumably due to the lack of a common vocabulary. Fleishman's taxonomy provides the framework for comparison, by "decomposing" the task into its constituent abilities (Landy, 1988, p. 274). As a result

of extensive analysis of many hundreds of tasks involving physical performance, nine basic physical abilities were defined: dynamic strength, trunk strength, static strength, explosive strength, extent flexibility, dynamic flexibility, gross body coordination, equilibrium, and stamina (Fleishman, 1979, p. 85).

> Essentially, this is laboratory research in which tasks are specifically designed or selected to test certain hypothesis about the organization of abilities in a certain range of tasks. The experimental battery of tasks is administered to several hundred subjects, and the correlation patterns examined. Subsequent studies tend to introduce task variations aimed at sharpening or limiting our ability factor determinations. The purpose is to define the fewest independent ability categories which might be most useful and meaningful in describing performance in the widest variety of tasks (Fleishman, 1978, p. 1009).

The factor analysis underlying these scales was reviewed and supported by Bernauer and Bonanno in 1975 (p. 27). To assess these abilities, Fleishman developed rating scales which contained a continuum of required effort varying from one (low effort) to seven (high effort). Further work by Theologus et al. (1970) demonstrated the reliability of the ability-based scales for classifying tasks. By calculating a rating level for each ability as it related to specific tasks, the foundation for the development of job standards was laid (Fleishman, 1979, p. 90). These standards would aid employers in producing a valid job analysis, the selection of appropriate personnel for specific jobs, and in the development of medical standards for physically

demanding jobs (Fleishman, 1982, p. 823 & 831). Campion (1983, p. 537) reviewed the literature on the selection of personnel for physically demanding jobs and noted several advantages of Fleishman's analysis. "The scales are easy to use in a field setting, they cover a wide spectrum of physical abilities, they link physical abilities to job tasks, they relate to known abilities that can be tapped by specific tests, and they are supported by research and a solid theoretical background." By 1984, Fleishman had expanded his research to other ability areas such as the cognitive and perceptual dimensions, producing a total list of 37 abilities (Fleishman and Quaintance, 1984,p. 317). Extensive research on the abilities rating scale had resulted in three conclusions regarding the methodology. "First...a seven point scale provides a statistically reliable tool for assessing amount of ability requirement. Second...personal experience with the task is not an essential prerequisite for using the scales. Finally...this scaling methodology can be used by raters who do not have specific experience in psychological assessment methods" (Fleishman and Quaintance, 1984, p. 321). In 1988, Fleishman and Mumford reviewed the current status of the abilities requirement approach to job analysis. They noted the expansion of the number of validated ability scales to 50, with the possibility of more being added as a result of

future research (p. 926). The authors concluded that this methodology was appropriate for use in a changing work environment, and was generalizable to different jobs or job circumstances (p. 931).

Validity of abilities analysis. Hogan and Fleishman (1979) reviewed the literature relating perceived and actual physical exertion. They investigated this connection and found a correlation coefficient of r = .83, between known metabolic demands and subjects' estimation of energy requirements (p. 200). The authors concluded that people tend to agree on the effort required for familiar tasks, and their perceptions regarding required effort is highly related to actual energy expenditure (p. 201). Hogan et al. (1980, p. 676) further studied the relationship between perceived metabolic costs of certain tasks whose energy demands were reported on in the literature. The correlation coefficient derived from this study was r = .72. In a second study, raters were asked to rate the metabolic demands of tasks they had just performed, and whose energy requirements had been calculated (p. 678). The correlation coefficient for this second investigation was r = .88. This research appears to support the ability of individuals to accurately relate actual effort with perceived effort. The results contribute to the criterion validity of the physical

abilities analysis method, since this evidence suggests that the scale ratings of task efforts correlate with actual demands.

Jones and Prien (1978, p. 37) used Fleishman's physical ability analysis in conjunction with an assessment of physical proficiency in a job situation. They found a correlation coefficient between the abilities analysis and physical proficiency of r = .40. This supports the criterion validity of the physical abilities scales, since there is a significant relationship between scale ratings and actual physical proficiency. Theologus and Fleishman (1971, p. 25) report a study which found a correlation coefficient of r = .64, between a physical abilities rating and actual task execution. Fleishman also reports a study which produced a correlation coefficient of r = .41, in a test relating physical abilities ratings and actual physical testing in the job situation (1984, p. 327). In 1988, Fleishman described research dealing with the relationship between the physical abilities scales and physical performance. He found seven studies which reported correlation coefficients of between r = .39 and r = .87 (p. 930).

Myers et al. (1980) used the Fleishman abilities analysis to evaluate several army job categories. They found intraclass reliabilities between raters ranging from

r = .70 to r = .99, thus suggesting that within specific occupational divisions, there can be good agreement on scale ratings (p. 20). Fleishman reviewed the literature on this aspect and found interrater reliabilities of between r = .69 and r = .87 in using the physical abilities scales (1984, p. 328).

There are no available validity studies in the literature dealing specifically with the development of medical standards using the physical abilities analysis approach. Validity may be inferred from the published results of the legal disputes which have taken place supporting this methodology as noted in the section on legal constraints.

Medical standards and ability analysis. Although there is work being done in the area of developing medical standards using the physical abilities analysis approach, there is a great dearth of published information dealing with the development, validation and use of such standards. The primary reason for this seems to be the market value of such standards, and the reluctance of the private firms using them to divulge their results. The one available study which has done extensive research and development of this type of analysis is the Medical Standards Project, produced by the County of San Bernadino, California (Nylander and

Carmean, 1987). This project, originally begun in 1975, has comprehensively generated medical standards for all bodily areas including the musculoskeletal area. These standards have been used by several agencies in California. Unfortunately, no results or evaluations are available. This report is easily available and is not constrained by a copyright restriction.

Criticisms of available studies. One of the major problems with many of the physical abilities analyses revolves around the use of rater-experts. These are persons with expertise in job analysis used to rate the abilities required of a particular job. Trattner et al. (1955, p. 190) found no significant difference between raters who had intimate knowledge of the job, and raters who had only read a job description. Despite this evidence, the courts have repeatedly rejected this type of analysis, noting that an adequate job assessment must involve the persons actually performing the function under question (Hogan and Quigley, 1986,p. 1201; Thompson and Thompson, 1982, p.872; Kirkland v. Department of Correctional Services, 1974). Many of the studies utilizing physical abilities analysis have involved independent raters to assess ability levels (Mallamad et al., 1980; Fleishman, 1979; Jones and Prien, 1978).

As noted previously, several of the studies have

included only those tasks most frequently performed or most critical to the job in question (Hogan and Quigley, 1986, p. 1201; Hogan and Bernacki, 1981, p. 469; Jones and Prien, 1978, p. 35). Since it may be the infrequent, very stressful tasks which precipitate injury, medical standards should be based upon the most physically demanding aspect of the job (Johnston and Bischoff, 1987; Norborg, 1985). Chaffin et al. (1978, p. 407) support this view in their research on preemployment strength testing.

> The result indicating that back pain incidence and severity does not depend on either the frequency of maximum efforts on the job or the combination of frequency times the relative strength loading of the employees has a biomechanical implication. It may be that the back tissues are as subject to failure under occasional overstresses as when frequently stressed.

The Medical Standards Project (Nylander and Carmean, 1987) is a very extensive and all-inclusive listing of medical standards as they relate to physical abilities analysis. However, the manner in which the threshold criteria for disability were derived leaves some area for question. A small number of SMEs were utilized in the development of the standards. For example, in the musculoskeletal system, subsection spine, only four physicians were consulted. The resultant standards could only be termed a consensus and not statistically valid. If a larger pool of experts were involved greater validity would result.

Finally, there is also a lack of specific criteria for developing cutoff scores for standardization. Arbitrary values lacking in formal development do not stand up well to legal scrutiny (Kleiman and Faley, 1985, p. 824; Norborg, 1985; Campion, 1983, p. 542). It would seem that expert, knowledgeable evaluation is needed, combined with a statistically valid compilation of the results.

E. RESEARCH ON SCALING TECHNIQUES

Fleishman's ability scale technique was developed over a period of several years (Norborg, 1985 Fleishman and Quaintance, 1984). A problem which arose concerned the type of data which were generated. Assessment of degree of effort within each ability generates ordinal data, making it difficult to deduce numeric standards. To circumvent this problem, the degree or amount of effort for each ability was compared to specific anchors which were in turn tied to a point distribution scale. By the use of a 7-point scale, the data could be converted to interval data, thus allowing for parametric statistical analysis (Landy, 1988, p. 277). In respect to the number of response categories, several studies have supported the use of a 7-point response scale. Masters (1974, p. 53) made the following conclusion in supporting a greater number of response categories.

> In situations where opinion is not widely divided toward the content the utilization of a small number of categories can result in little discrimination among respondents, low total score variability and, consequently, low reliability. When multicategory scalings are employed, the total score distribution is spread out and reliability is increased.

Landy and Farr (1983, p. 83) reviewed the available literature and noted that reliability decreased with less than 3 or more than 7 categories. They recommended the use of a scale with less than 9 response points. Finally, Norborg (1985), in his review of the medical standards technique, notes that some researchers have increased the number of scale points from 7 to 25, to aid in rater comfort; however, this has not been proven statistically valid. Most developers of this methodology have opted to use the 7-point scale in their research (Nylander and Carmean, 1987).

In the conversion of the perceived effort rating to the 7-point scale, anchors must be created to qualify the category level. There are three basic types of anchors: numerical, adjectival and behavioral. Landy and Farr (1983, p. 84) arrived at the conclusion that behavioral anchors are better than numerical or adjectival criteria. They noted increased reliability, increased effectiveness, and less susceptibility to distortion, when using the behaviorally constructed anchors. Kleiman and Faley (1985,

p. 814) support this view and note the importance of careful anchoring methods. In the case of scales with difficult or absent dimensional definitions, appropriate behavioral anchors increased reliability. This would be the case for the physical abilities analysis, due to the difficulty in differentiating abilities. A study by Smith and Kendall (1963) addressed specifically the development of unambiguous anchors for rating scales. The group under study was nurses and the anchors were developed by their nursing supervisors. This study noted that despite the differences in actual job functioning by the head nurses, they could "be reasonably expected to share some common core of experience and of values concerning behavior on the jobs they will rate" (p. 150). In addition, the authors felt that a strong point in the development of the anchors was that the "evaluations of the behavior have been made by judges at least reasonably comparable to those who will eventually use the scales" (p. 154). The study concluded that the group of head nurses was able to produce a consistent and reliable set of behavioral anchors for a nursing rating scale.

In respect of methods of data collection, Norborg (1985) discusses the various methods available and concludes that questionnaire methodology is the technique of choice for large-scale validation projects. He supports this deduction on the following basis.

> The questionnaire method has two characteristics which account for its superiority: (a) it can be used to economically collect data from a large number of incumbents, supervisors and job analysts; and (b) it can be used to collect data in a standard format that permits aggregation and statistical analysis...that is legally defensible.

This type of data collection also obtains information which may be compared with other research that utilized the same methodology.

CHAPTER III

METHODOLOGY

The purpose of this study was to develop a job-specific abilities analysis for nurses, and to compile medical standards for disability assessment based on abilities analysis, appropriate for The University of Tennessee Medical Center at Knoxville. This chapter presents the methodology used to achieve this purpose. Part A describes the populations. Part B covers the study area and the selection of the scales. Part C describes the techniques used in the ratings of the abilities, while Part D covers the development of the medical standards. A schematic outline of the methodology of this study is presented as Figure 1, in the form of a flow chart.

A. SELECTION OF THE POPULATIONS

Nursing. There are 735 full-time and part-time nurses employed at the University of Tennessee Medical Center at Knoxville. Of these 46 are of supervisory level. Within the job category of nurse, there is much variability of function. This variation comes in the form of different duties, different environments, and different schedules.

Nursing staff SMEs	Health Care Professional SME
Step 1. Review of nursing tasks.	Step 6. Medical standard category rating for ability scales.
Step 2. Selection of nursing tasks for scales.	Step 7. Data analysis.
Step 3. Creation of behavioral anchors for scales.	
Step 4. Abilities scale rating.	
Step 5. Data analysis.	

Step 1. Nursing directors review nursing task list and update as appropriate for study area.
Step 2. Nursing directors select specific stressful tasks as appropriate for each ability scale.
Step 3. Nursing supervisors create behavioral anchors for each ability scale and its specific task example.
Step 4. Nursing staff rate each of the six ability scales.
Step 5. Data analysis. Mean ratings for each ability scale.Comparison of means for nurse staff and supervisors.
Step 6. Health care professionals rate each ability scale in relation to all 15 standards categories.
Step 7. Data analysis. Mean ratings for each medical standard scale. Comparison of means for each health care professional group.

Figure 1. Flow chart of methodology.

Despite this diversity, task selection was performed to ensure common activities shared by all University of Tennessee Medical Center nurses. In the matter of sample selection, however, some difficulty arose. A traditional random sample might exclude certain groups of nurses, since some units function with a limited number of personnel. Norborg (1985) rejects the use of a random sample and suggests the use of a systematic sampling technique. For the purposes of this study, attempting to review all nursing areas for this type of sample was felt to be prohibitive. It was therefore decided that the entire population of nurses at the Medical Center would be utilized as the study population. Similarly, the entire population of nursing supervisors was included in the development and rating of the scales.

Health care professional. Three groups of health care professionals were selected for this study. The first group would function as the expert reference for the other two and was made up of orthopedic and neurologic surgeons. Twelve physicians were selected for this category. The second group consisted of general practice physicians whose results would be compared with the reference physicians of the first group. This second category was made up of twelve physicians. The third and final group contained physical

therapists whose results would also be compared with the first group. Their number was seven. All professionals in these groups were volunteers. No random sample was attempted due to the nature of the instructions and the time constraints involved. All health care professionals reported experience in evaluating low back pain, particularly within the context of a work situation.

The groupings so developed are summarized in Table 1. They were chosen to provide for an adequate coverage of the health care professionals. It was felt that if there was no statistical difference between the second and third groups, and the first reference group, then all groups could be combined to increase the statistical power of the instrument. The non-reference groups were included to demonstrate the presence or absence of consistency of a sector of the health care professional population who potentially would benefit greatly from the development of such a tool. Most preplacement examinations are performed by physicians who fall within the grouping of general practitioners. These would be family practitioners, occupational medicine specialists and emergency medicine specialists. Physical therapists were included since they perform much of the actual hands-on assessments of physical ability.

TABLE 1.

LISTING OF SUBJECT MATTER EXPERT CATEGORIES

SME Category	Number
Staff Nurses	735
Nursing Supervisors	46
Orthopedic/Neurologic Surgeons	12
General Practice Physicians	12
Physical Therapists	7

B. STUDY AREA AND SCALE SELECTION

Study area. Discussions with the Director of Human Resources at the University of Tennessee Medical Center at Knoxville, and the Associate Administrator for Nursing, prompted the selection of impairment related to the low back as the most beneficial area for study. This was supported by a review of the types of worker's compensation involvement for 1988, showing a high level of claims for back problems (Fields, 1989). Given the pilot nature of this research, it was felt that back disability assessment would be the most time effective study.

Impairment and category determination. Using the Medical Standards Project guidelines (Nylander and Carmean, 1987), which had been purchased expressly for this study, a range

of impairment problem areas were selected. Selection was based purely on the relevance of the problem area to the back. Problem areas and categories are listed in Table 2. Within each problem area there were three category subdivisions. These were developed for the Medical Standards Project to include a measure of symptomatology which the individual was experiencing. It was felt that as noted previously, the mere existence of disease or impairment did not necessarily indicate illness or incapacity. Therefore, the following categories were utilized, as developed by Nylander and Carmean (1987, Vol. II, p. I-173).

Category A. The individual is completely asymptomatic. They experience no pain or limitation of any kind. This person would be evaluated solely on the basis of history and pathology.

Category B. This individual would not experience any type of symptomatology with the activities of daily living. They would, however, experience pain and limitation when performing activities considered more strenuous than those required of daily living, such as jogging one-half mile.

Category C. This individual would experience pain and limitation while performing the simple activities of daily living. Further, they may experience continuous and unrelenting symptoms even at rest. This represents the most

TABLE 2.

MEDICAL STANDARDS CATEGORIES

Standard	Category	Problem
1	A	Previous low back pain
2	B	Previous low back pain
3	C	Previous low back pain
4	A	Previous sciatica
5	B	Previous sciatica
6	C	Previous sciatica
7	A	Previous surgery on low back
8	B	Previous surgery on low back
9	C	Previous surgery on low back
10	A	Scoliosis
11	B	Scoliosis
12	C	Scoliosis
13	A	Spondylolisthesis
14	B	Spondylolisthesis
15	C	Spondylolisthesis

Adapted from Nylander and Carmean, 1987, Vol. II, p. I-174.

severe case and presents a definite degree of dysfunction.

The medical problem areas as chosen for the study were as follows.

Previous low back pain. This area includes a range of symptomatology related to the lower back. The health care professional groups were instructed to interpret this problem as including both pain and limitation in functioning.

Previous sciatica. This area includes the low back pain and limitation of functioning of the above area, but in addition, it includes radiation of pain in a sciatic distribution.

Previous surgery on low back. Surgery in this area includes laminectomy, fusion, discectomy, chymopapain injection or facet rhizotomy.

Scoliosis. This problem area was restricted to scoliosis of greater than 30 degrees in the lumbar area, and greater than 50 degrees in the thoracic area. It excluded any prior surgery for correction of this defect.

Spondylolisthesis. This area included the radiologic diagnosis of this defect without any prior surgery for correction.

Scale selection. Fleishman's Ability scales were utilized in this study based upon their extensive development and

construct validity (Fleishman and Mumford, 1988; Fleishman and Quaintance, 1984). The Physical Abilities Approach has utilized from six to eleven of Fleishman's Abilities. A review of the literature as applied to nursing evaluation only elicited one reference to Physical Abilities Analysis directly performed on nurses, and it only listed vague results without specific values (Fleishman and Mumford, 1988, p. 932). In concert with personnel from the University of Tennessee Medical Center at Knoxville, it was decided to select six of the Physical Abilities for use in the current study. These were judged as being most beneficial to the needs of the Medical Center. The scales chosen are as follows. The definitions were adapted from Fleishman and Mumford (1988, p. 921), Nylander and Carmean (1987, Vol. I, p. V-44 - V-67), Fleishman and Quaintance (1984, p. 324-325), and McCormick (1979, p. 352-353).

Scale 1. Static Strength. This is the ability to use muscle force to lift, push, pull, or carry objects. It is the maximum force that one can exert for a brief period of time. Force is exerted continuously up to the amount needed to move the object.

Scale 2. Trunk Strength. This ability involves the degree to which one's stomach and lower back muscles can support part of the body repeatedly or continuously over time. The ability involves the degree to which these trunk

muscles do not "give out", or fatigue, when they are put under such repeated or continuous strain.

Scale 3. Stamina. This is the ability to exert oneself physically over a period of time without getting winded or out of breath. It involves the capacity to maintain physical activity over prolonged periods of time. It is concerned with cardiovascular condition.

Scale 4. Extent Flexibility. This is the ability to bend, stretch, twist or reach out with the body, arms and/or legs. It concerns the degree of flexibility of muscle groups, but does not include repeated or speed flexing.

Scale 5. Dynamic Flexibility. This is the ability to make repeated trunk and/or limb flexing movements where both speed and flexibility of movement are required. It includes the ability of these muscles to recover from the strain and distortion of repeated flexing.

Scale 6. Mobility. The capacity to move one's body from place to place. This capacity does not include accuracy, speed, or precise coordination.

A listing of the above scales with the rating format and sample anchors is included as Appendix B. The scales listed in Appendix B were not the resultant scales developed by the nurses under the present study. Rather, these scales were the examples presented to the nurses to explain the methodology.

C. ABILITIES RATING

Task and anchor selection - Step 1, Step 2, Step 3. In Step 1, the complete listing of the nursing tasks (Appendix A) generated by the Kentucky Nursing Delineation Study (Lang, 1988) was presented to the 9 directors of nursing at the Medical Center. Their instructions were to review the list of nursing tasks and to add any tasks which they felt were important or stressful in the context of the University Medical Center. Following this step, a meeting was held between the researcher and the directors of nursing. The function of this meeting was to assign a specific task from the list generated, to each of the six ability scales as indicated in Step 2. This task was to be representative of routine nursing duties, and appropriate for the ability under question. The tasks selected were chosen to illustrate the most stressful function a nurse performs, within the bounds of the particular ability under question. The rationale being that if tasks representing the most stressful aspect of the physical domain of nursing were selected, other less stressful tasks would be covered by the resultant medical standards. Examples of the ability scales as presented in Steps 1 and 2 may be found in Appendix B, while examples of the instruction sheets given to the nurse directors may be found in Appendix C.

The next stage of the study, Step 3, involved the creation and selection of behavioral anchors for the six ability scales which would be meaningful for nurses working within the Medical Center. For this step, 31 nursing supervisors were presented with the scales as found in Appendix B, and were instructed to create a series of three behavioral anchors for each of the six scales to replace the existing anchors. By a modified Delphi technique, the resultant listing of behavioral anchor suggestions was returned to the same supervisors to make a final selection of the best set of anchors for each scale. Examples of the instructions for this step may be found in Appendix C. The actual choice of anchors was by consensus of the group of nursing supervisors. The anchors selected were chosen to provide reference points on the rating scale to assist in evaluating the tasks. These behavioral points presented a range from low perceived effort on the scale to high perceived effort. The language used and the situations presented were picked so as to be specific for the staff nurses for whom the scales were created. An example of such a scale together with its general behavioral anchors is included as Figure 2. On the left side of the scale are two statements representing performance extremes of the ability. On the right side of the scale are the behavioral anchors. A general statement explaining the particular ability was

Performance Extreme	Scale	Behavioral Anchors
Requires very fast, skillful, coordinated use of hands, to grasp, place, move or assemble objects.	7 _____	- Perform open heart surgery
	6 _____	
	5 _____	
	4 _____	
	3 _____	- Prune shrubs with shears
	2 _____	
Requires some speed, skill, and coordination, to grasp, place, move or assemble objects.	1 _____	- Turn switch on TV

From Nylander and Carmean, 1987, p. V-79.

Figure 2. Ability scale example - manual dexterity.

placed below the ability title on the actual survey scales. The seven point scale permits an assessment of the physical stress required for the particular ability, with the level of 1 representing low physical effort, while the level of 7 represents a high degree of physical effort.

Ability analysis - Step 4. Once the tasks and anchors had been selected for each of the six ability scales, the scales were distributed to the entire nursing staff of the University of Tennessee Medical Center at Knoxville. They were distributed by the individual nurse supervisors in a packet form. A copy of the survey packet including the instruction sheets, ability scales and demographic sheet is included in Appendix D. Each nurse was asked to rate each of the six tasks using the 7-point scale. The nurses were to rate the tasks based upon their perception of the greatest effort required to perform them. The anchors were used as benchmarks to aid in the selection. Once completed, the packets were returned to the nursing supervisors who were responsible for their completion. Using this method of distribution obviated the need for follow-up correspondence with the individual staff nurses.

Data analysis - Step 5. After collecting the returned packets, each was examined to ensure correctness of

completion. Those scales not rated in a correct manner were rejected. In an attempt to provide some measure of reliability, a method for assessing internal consistency of the results was developed. In this method a random sample of half of the returned surveys was correlated with the remaining half to obtain a coefficient of correlation. This technique at first appears to be an example of the split-halves method of assessing reliability. However, unlike the split-halves method,the researcher was not evaluating the same individual on a series of questions. Rather, different groups of individuals were compared on the same scale. Thus, the result of this statistic was in reality an assessment of the degree of randomness of the sample. Once the correlation had been performed, a mean was calculated for each of the two halves of the sample. A t-test for significance of the difference of the means was performed, with a chosen alpha level of $p = 0.05$ (Ferguson, 1981, p. 177). Once a comparison of the 2 halves of the data was concluded, a mean was calculated for each ability for the entire population. This mean was then recorded as the threshold effort requirement, for each ability, for nurses at the University of Tennessee Medical Center at Knoxville. The collective set of six Ability Ratings was considered as representative of the maximal physical effort needed to perform as a nurse, and was compared with the medical

standards rating derived by the health care professionals group of SMEs. One further test was performed after the ratings were calculated. The means of each scale for the staff nurses and the nursing supervisors were compared to see if there was a significant difference. The method used was the t-test for significant difference between two means for independent samples (Ferguson, 1981, p. 177). The significance level was set at $p = 0.05$. If the nursing supervisors were truly able to assess the effort required by the staff nurses, then the means should show no significant differences.

D. MEDICAL STANDARDS DEVELOPMENT

Standards development - Step 6. The selected ability scales were given to each of the designated health care professional groups. The tasks generated by the nurse supervisors were not included in this methodology. A meeting was held between the researcher and each individual health care professional to ensure adequate understanding of the instructions. A sample of the survey package given to each health care professional, including the instruction sheet and abilities scales, is included in Appendix E. Each SME was asked to rate on the 7-point scale, all six abilities in relation to the standards categories listed in

Table 2. In that there were 15 categories and 6 scales, each SME was required to make 90 individual ratings. The criterion for rating was the greatest level of physical stress at which the SME felt an individual with the particular pathology or symptomatology could safely perform each specific ability. Any stress at a higher level than the medical standard rating would probably bring about injury. Lesser physical stresses could be accomplished without harm. After completion each rating was collected by the researcher.

Data analysis - Step 7. After collection of the medical standards ratings, a mean was calculated for each of the 90 scales, for each of the three health care professional groups. Therefore, a total of 270 means were produced. The means were compared for the three groups by way of an analysis of variance (ANOVA). The method used was that of Ferguson (1981, p. 243), with a significance level for alpha selected at $p = 0.20$. In the case of a significant F value, t-tests were performed to determine which means which were significantly different. If a non-significant F value was found, it could be assumed that the three groups did not differ significantly from each other, and the results could be pooled into one set of standard values. In the case of a finding of a significant F value, the groups for which no

significant difference was found on the t-tests were pooled. The alpha level chosen for both the F test and the t-test was set at p = 0.20. This level was chosen in order to lessen the chances of making a Type II error. The rationale behind this decision was that if only a significant difference was being sought, an alpha level of p = 0.05 would be adequate. However, since an attempt was being made to pool the results of the groups and the numbers within each group were low, a greater alpha level of p = 0.20 was chosen. The pooled results were utilized to increase the power of the threshold values. The resultant means were listed for each of the 6 scales for all 15 categories of medical problems. These means were taken to represent the threshold value for each of the given abilities.

Nursing medical standards. Once the Ability Scales had been developed specifically for nurses, and the Medical Standards were created for each ability, the values could be compared. This was the real end-point of the research, to develop a threshold medical standard and a valid assessment of physical stress for nurses, such that a statement could be made regarding employability in the case of pathology or symptomatology. By comparing the required physical effort required by nurses, with the allowable medical standards for

each category of medical problem, greater weight could be placed on the disability or preemployment assessment conducted by the physician.

CHAPTER IV

ANALYSIS OF THE DATA

This chapter contains an analysis of a survey of 735 nurses employed at The University of Tennessee Medical Center at Knoxville, and a selection of 31 health care professionals. The purpose of the study was to develop, in reference to the low back, standards of actual physical stress experienced by nurses, as well as medical standards of allowable physical stress given the constraints of certain medical problems. The data were collected and statistically analyzed using a personal computer running the MINITAB package (Minitab, Inc., 1989).

A. DESCRIPTION OF POPULATIONS

Response rates. In step 1 and 2, from Figure 1, a total of 9 nursing directors were surveyed to review the nursing task list and to select the abilities-specific tasks. In step 3, a total of 31 nursing supervisors were surveyed to develop nurse-specific behavioral anchors. For step 4, the entire population of 735 nurses were surveyed to complete the abilities rating scales. Finally, for step 6, a total of 31 health care professionals were surveyed to complete

the medical standards ability scales. The population numbers as well as the response rates are included as Table 3. Also included are the usable response rates after review for correctness of completion.

Of all the responses returned in the various steps of this study, 16 were rejected due to incorrectness of completion. These 16 were all responses from staff nurses to the abilities scale selection, and were rejected due to ambiguity of response, multiple response or absence of response. This represents a rejection rate for the nursing abilities step of 7 %.

Demographic information staff nurses. As part of the ability scale selection of Step 4, a demographic sheet was included in the survey package distributed to all 735 nurses at the Medical Center. An example of this sheet may be found with the complete survey in Appendix D. Results of this section may be found in Table 4. One area of this response related to the respondents height and weight, which were included to provide an assessment of the presence or absence of obesity. Each respondent's results were compared with a table of desirable weights for this determination. The table used was that found in Lozy et al. (1980, p. 108). Since an assessment of body frame was not a part of this study, the range of weights for a medium-framed individual

TABLE 3

RESPONSE RATES OF SURVEY

Populations	Sample	Response	% Response
Step 1 and 2			
Nurse directors	9	9	100.00
Step 3			
Nurse supervisors	31	16	51.16
Step 4			
Total nursing staff	735	242	32.93*
		226	30.75
Staff nurses only	689	218	31.64*
		202	29.32
Nurse supervisors	46	24	52.17
Step 6			
Orthopedic/Neurologic surgeons	12	9	75.00
General practitioners	12	9	75.00
Physical therapists	7	6	85.71

* Total response including nonusable response. All other percentages represent usable response rates.

was selected for comparison. The threshold level for the determination of obesity was that weight which was 20 % above the upper range for each given height. As noted in Table 4, 78 or 35 % of the nurses were determined to have height and weight combinations which allow them to be considered obese, given the above definition.

Of the 226 respondents to this step of the survey, 18 (8 %) were male, leaving the majority of 208 (92 %), female. Staff nurses comprised 89 %, while 11 % reported themselves to be supervisory personnel.

A high number of individuals, 45 or 20 %, reported a history of on-the-job injuries to their low back. Further, 89 or 39 %, reported back pain associated with limitation in function, while 40 or 18 %, reported back pain associated with lost work time. An additional 6 individuals, or 3 % reported surgery of the low back, however, it was not determined whether this was related to injury or congenital defect.

Most of the respondents, 140 or 62 %, reported a past employment history of moderate physical activity. Similarly, 149 or 66 %, reported a moderate level of leisure physical activities.

Specialty breakdown of health care professionals. Within the reference group of orthopedic and neurologic surgeons,

TABLE 4

DEMOGRAPHIC DATA FOR NURSING STAFF RESPONDENTS
ABILITY SCALE DETERMINATION: STEP 4

Variable		Result	%
Response			
	Total	226	
	Male	18	7.96
	Female	208	92.04
	Staff	202	89.38
	Supervisor	24	10.62
Obesity		78	34.51
Previous history			
	On the job injury back	45	19.91
	Back pain and limitation	89	39.38
	Back Pain and lost work time	40	17.70
	Surgery low back	6	2.66
Previous employment			
	Low physical activity	9	3.98
	Moderate activity	140	61.95
	Strenuous activity	77	34.07
Leisure activities			
	Low physical activity	35	15.49
	Moderate activity	149	65.93
	Strenuous activity	42	18.58

5 were neurologic surgeons and 4 were orthopedic surgeons. In the group of general practitioners, 4 were family physicians, 3 were emergency physicians, 1 reported his specialty as occupational medicine and 1 practiced public health/preventive medicine. All of the above physicians were male. In the group of physical therapists all were female and all were in the full-time practice of physical therapy, specifically related to back disability programs. No occupational therapists were able to be surveyed.

B. ABILITIES SCALE RATING

Step 1. Of the 9 nursing directors who completed this step of the study, none felt any additional tasks were needed. All felt the Nursing Task List was adequate for the range of duties performed at The University of Tennessee Medical Center at Knoxville. The full Nursing Task List may be found in Appendix A.

Step 2. Again all 9 nursing directors completed this section of the study. After the initial responses were returned a meeting was held between the researcher and the group of 9 nursing directors. At this meeting the list of selected tasks was presented and a consensus was achieved

concerning which six tasks would be selected as most appropriate for the six ability scales. The tasks so selected and their individual ability scales are presented as Table 5.

Step 3. Of the 31 nursing supervisors who were asked to participate in this section, 16 returned lists of new behavioral anchors. Through the use of a modified Delphi technique whereby edited lists would be returned to the supervisors for reassessment, a selection of nurse-specific behavioral anchors was created. The initial groupings of newly created anchors as well as the final selection is included in Appendix F. Once the ability scales had been paired with the nurse-specific behavioral anchors, a test group of 9 staff nurses was selected to assess the appropriateness of the new anchors. This test group was presented with two sets of the ability scales. The first included the original behavioral anchors, while the second included the nurse-specific anchors. The test group was asked to evaluate the clarity of the two sets of scales and comment upon the appropriateness of the behavioral anchors. Unanimously, all 9 of the test group found difficulty with the newly created anchors. They felt the new anchors were much less appropriate to the scales than the original anchors. They did feel that the new anchors reflected the

TABLE 5

NURSING TASK SELECTION: STEP 2

Ability Scale	Nursing Task
1. Static strength	Lifting a patient from a bed to a chair.
2. Trunk strength	Giving a bed bath
3. Stamina	Performing CPR
4. Extent flexibility	Starting an IV
5. Dynamic flexibility	Passive range of motion exercises
6. Mobility	Making nursing rounds

duties of nurses, but they felt that a degree of clarity and ease of understanding had been lost. All 9 test subjects, while supporting the use of nurse-specific behavioral anchors, felt the original anchors were better suited to the goals of the present study. To test the accuracy of these reports, the scales were presented to two additional groups of nurses at another Knoxville hospital. A group of 7 nurses were given the ability scales with the original anchors, and a second group of 6 nurses were given the scales with the nurse-specific anchors. The actual scale values obtained from these two groups were compared statistically through their variance. The results of this comparison are included as Table 6, with a complete listing

of results in Appendix F, Table F-1 and Table F-2.

When the variance of the data in the two sets of scales was compared, it was noted that the variance for 5 out of the 6 scales was greater for the nurse-specific scales than for the original scales. While the means of the two groups were not statistically different, as noted in the data of Appendix F, Table F-2, the greater variance of the nurse-specific scales supported the statements of the group of nurses who felt the behavioral anchors of the original scales presented a more easily understood rating guide. For these reasons, it was decided to return to the original behavioral anchors as developed by Nylander and Carmean (1987).

Step 4. As noted earlier, 735 survey packages were distributed to the entire nursing population of the medical center utilizing the original behavioral anchors. An example of the survey package may be found in Appendix D. From the returned material, 226 usable ability scale sets were obtained.

Step 5. To assess the internal consistency of the scales, a random sample was selected of one-half of the values for each scale. A correlation was performed between that random sample and the remaining half of the data using the

TABLE 6

COMPARISON OF NURSE-SPECIFIC BEHAVIORAL ANCHORS WITH ORIGINAL BEHAVIORAL ANCHORS: STEP 3

	Ability	Original Scale Variance	Nurse-Specific Scale Variance
1.	Static strength	1.56	2.16
2.	Trunk strength	3.13	3.35
3.	Stamina	1.32	1.59
4.	Extent flexibility	0.67	1.10
5.	Dynamic flexibility	1.32	1.46
6.	Mobility	1.61	1.10

method of Ferguson (1981, p. 112). Correlation coefficient results may be found in Table 7. The range of r values is between 0.01 and 0.10, precisely what was expected, demonstrating a random sample of the data. A comparison of the means of the two halves may be performed treating each half as an independent sample. A t-test was performed on the two half samples of the nursing data to test for the significance of the difference of their means. Results of this test are found in Table 8. No significant difference was found between the two random halves samples at an alpha level of $p = 0.05$. This supports the internal consistency of the scales.

TABLE 7

CORRELATION COEFFICIENTS OF RANDOM HALF SAMPLES OF THE NURSING ABILITY SCALE DATA: STEP 5

Ability	r
1. Static Strength	0.017
2. Trunk Strength	0.012
3. Stamina	0.095
4. Extent Flexibility	0.104
5. Dynamic Flexibility	0.022
6. Mobility	0.068

TABLE 8

COMPARISON OF t TESTS OF RANDOM HALF SAMPLES OF NURSING ABILITY SCALE DATA: STEP 5

Ability Scale	Xa	Xb	t	p
1. Static Strength	5.64	5.69	-0.36	0.72
2. Trunk Strength	3.58	3.74	-0.99	0.32
3. Stamina	5.41	5.64	-1.34	0.18
4. Extent Flexibility	2.67	2.73	-0.30	0.77
5. Dynamic Flexibility	3.84	3.77	0.41	0.68
6. Mobility	3.54	3.68	-0.65	0.52

Xa = random sample of 113 from nursing ability scale data
Xb = remaining half of nursing ability scale data

Next, the entire data for each scale were analyzed to determine the means and standard deviations. The mean value so calculated was taken to represent the threshold value for each of the scales. The results of this analysis are recorded in Table 9. The complete listing of the results of this section may be found in Appendix G.

Finally, a comparison was made between the results of the entire sample of nurses and that group of nurses who identified themselves as supervisory personnel. A t-test of the significance of the difference between their means was performed with the alpha level of significance set at $p = 0.05$. The results of this test are found in Table 10.

TABLE 9

NURSING ABILITY SCALES DATA RESULTS: STEP 5

Ability Scale	X	SD
1. Static Strength	5.74	1.10
2. Trunk Strength	3.63	1.21
3. Stamina	5.50	1.30
4. Extent Flexibility	2.70	1.38
5. Dynamic Flexibility	3.77	1.34
6. Mobility	3.51	1.62

TABLE 10

COMPARISON OF t TESTS OF RESULTS OF SUB-GROUPS OF STAFF AND SUPERVISORS FROM NURSING ABILITY SCALE DATA: STEP 5

Ability Scale	Xa	Xb	t	p
1. Static Strength	5.73	5.87	-0.66	0.52
2. Trunk Strength	3.63	3.46	0.84	0.40
3. Stamina	5.50	5.42	0.34	0.74
4. Extent Flexibility	2.70	2.71	-0.02	0.99
5. Dynamic Flexibility	3.77	4.00	-0.80	0.43
6. Mobility	3.51	3.58	-0.24	0.81

Xa = mean of entire nursing population
Xb = mean of supervisor population

As can be readily sen, there was no significant difference between the two groups. The range of p values was between 0.40 and 0.99, demonstrating a very high degree of similarity of the two samples.

C. MEDICAL STANDARDS DEVELOPMENT

Step 6. A total of 31 health care professionals were selected to create the medical standards for the study. Twenty four usable sets of results were returned, with each data set including 90 completed scales. Since all returned surveys for this step were filled out correctly, no surveys

had to be eliminated. None of the respondents reported any difficulty with the scales or the instructions.

Step 7. Means were calculated for all 270 data sets, representing 90 scales for each of the three health care professional groups. An analysis of variance was then performed on the three means for each scale, and if necessary, a t-test for significance of variance was performed if a significant F value was obtained. Results of this step are included in Tables 11-25. The purpose of the study was to develop medical standards for back disability, and as such the health care professional group of orthopedic and neurologic surgeons was used as a reference group based upon their expertise in this area. Results of the general practitioner group and the physical therapy group were compared with the results of the orthopedic/neurologic surgeons group in the case of a significant F value. If the F value was not significant the results of the three groups were pooled to arrive at the final threshold value. If a significant F value was obtained, a t score of the comparison between the orthopedic/neurologic surgeons group and the general practitioners group was produced. Also, a t score was obtained between the orthopedic/neurologic group and the physical therapy group. A significant t score was used to

TABLE 11

MEDICAL STANDARDS DATA PREVIOUS LOW BACK PAIN
CATEGORY A

Statistic		Ability Scale 1	2	3	4	5	6
Ortho/Neuro	X	6.67	6.44	6.56	6.67	5.89	6.89
	SD	0.71	0.88	0.53	0.71	1.05	0.33
Gen. Pract.	X	6.33	5.78	6.00	5.89	5.67	6.89
	SD	0.71	0.97	0.71	1.05	0.87	0.33
Phys. Ther.	X	6.50	6.33	6.00	6.16	6.00	6.67
	SD	0.55	0.52	0.63	0.75	0.89	0.52
ANOVA	F	0.55	1.54	2.22*	1.86*	0.25	0.75
	p	0.58	0.24	0.13	0.18	0.78	0.49
Ortho/GP	t			1.89	1.84		
	p			0.08	0.09		
Ortho/PT	t			1.78	1.29		
	p			0.11	0.23		
GP/PT	t			0.00	0.60		
	p			1.00	0.56		
Pooled Groups							
	X	6.50	6.17	6.56	6.47	5.83	6.83
	SD	0.70	0.87	0.53	0.74	0.92	0.38
	N	24	24	9	15	24	24

* significant at p = 0.20

Ability Scales 1 = Static Strength
2 = Trunk Strength
3 = Stamina
4 = Extent Flexibility
5 = Dynamic Flexibility
6 = Mobility

TABLE 12

MEDICAL STANDARDS DATA PREVIOUS SCIATICA
CATEGORY A

Statistic		Ability Scale 1	2	3	4	5	6
Ortho/Neuro	X	6.11	6.11	6.00	5.89	5.44	6.33
	SD	0.60	0.93	0.87	1.05	1.13	0.50
Gen. Pract.	X	6.00	5.44	5.67	5.67	5.22	6.44
	SD	0.71	0.73	0.71	1.12	1.20	0.73
Phys. Ther.	X	5.83	6.00	5.67	5.83	5.50	6.17
	SD	0.75	0.63	0.52	0.75	1.05	0.75
ANOVA	F	0.30	1.78*	0.58	0.11	0.13	0.32
	p	0.74	0.19	0.57	0.89	0.88	0.73
Ortho/GP	t		1.70				
	p		0.11				
Ortho/PT	t		0.28				
	p		0.79				
GP/PT	t		-1.57				
	p		0.14				
Pooled Groups							
	X	6.00	6.07	5.79	5.79	5.38	6.33
	SD	0.66	0.80	0.72	0.98	1.10	0.64
	N	24	15	24	24	24	24

* significant at p = 0.20

Ability Scales 1 = Static Strength
2 = Trunk Strength
3 = Stamina
4 = Extent Flexibility
5 = Dynamic Flexibility
6 = Mobility

TABLE 13

MEDICAL STANDARDS DATA PREVIOUS SURGERY
CATEGORY A

Statistic		Ability Scale 1	2	3	4	5	6
Ortho/Neuro	X	5.44	5.89	5.56	5.78	5.11	5.78
	SD	0.88	1.05	1.13	1.09	1.17	0.97
Gen. Pract.	X	5.00	4.78	5.22	4.78	4.89	6.00
	SD	0.50	0.83	0.44	0.97	1.54	0.87
Phys. Ther.	X	6.00	6.00	5.67	5.83	5.83	6.17
	SD	0.63	0.63	0.51	0.75	0.75	0.75
ANOVA	F	3.71*	4.82*	0.68	3.10*	1.08	0.36
	p	0.04	0.02	0.52	0.07	0.36	0.70
Ortho/GP	t	1.32	2.48		2.05		
	p	0.21	0.03		0.06		
Ortho/PT	t	-1.42	-0.25		-0.12		
	p	0.18	0.80		0.91		
GP/PT	t	-3.25	-3.22		-2.36		
	p	0.01	0.01		0.04		
Pooled Groups							
	X	5.22	5.93	5.60	5.80	5.21	5.96
	SD	0.73	0.88	0.91	0.94	1.25	0.86
	N	18	15	24	15	24	24

* significant at p = 0.20

Ability Scales 1 = Static Strength
2 = Trunk Strength
3 = Stamina
4 = Extent Flexibility
5 = Dynamic Flexibility
6 = Mobility

TABLE 14

MEDICAL STANDARDS DATA SCOLIOSIS
CATEGORY A

Statistic		Ability Scale 1	2	3	4	5	6
Ortho/Neuro	X	6.11	6.22	6.44	5.89	5.44	6.56
	SD	0.93	1.09	0.53	0.93	1.13	0.73
Gen. Pract.	X	5.33	5.11	5.33	4.67	4.67	5.56
	SD	1.32	1.36	1.00	1.32	1.50	0.88
Phys. Ther.	X	6.33	5.83	6.33	5.83	5.67	6.00
	SD	0.82	0.98	0.82	1.17	1.51	1.55
ANOVA	F	1.91*	2.04*	4.99*	3.07*	1.17	2.11*
	p	0.17	0.16	0.02	0.07	0.33	0.15
Ortho/GP	t	1.44	1.91	2.95	2.27		2.63
	p	0.17	0.08	0.01	0.04		0.02
Ortho/PT	t	-0.49	0.72	0.29	0.10		0.82
	p	0.78	0.49	0.78	0.92		0.44
GP/PT	t	-1.81	-1.19	-2.12	-1.80		-0.64
	p	0.10	0.26	0.06	0.10		0.54
Pooled Groups							
	X	6.20	6.07	6.40	5.87	5.21	6.33
	SD	0.86	1.03	0.63	0.99	1.38	1.11
	N	15	15	15	15	24	15

* significant at p = 0.20

Ability Scales 1 = Static Strength
2 = Trunk Strength
3 = Stamina
4 = Extent Flexibility
5 = Dynamic Flexibility
6 = Mobility

TABLE 15

MEDICAL STANDARDS DATA SPONDYLOLISTHESIS
CATEGORY A

Statistic		Ability Scale 1	2	3	4	5	6
Ortho/Neuro	X	6.22	6.44	6.44	6.11	5.89	7.00
	SD	1.09	0.73	0.73	0.93	1.05	0.00
Gen. Pract.	X	5.56	5.44	5.33	4.78	4.33	6.00
	SD	0.88	1.01	1.23	1.30	1.58	1.00
Phys. Ther.	X	5.67	5.67	5.67	5.50	5.50	5.83
	SD	1.51	1.51	1.03	1.38	1.87	1.60
ANOVA	F	0.86	2.14*	2.81*	2.81*	2.62*	3.28*
	p	0.44	0.14	0.08	0.08	0.10	0.06
Ortho/GP	t		2.41	2.34	2.50	2.46	3.00
	p		0.03	0.04	0.03	0.03	0.02
Ortho/PT	t		1.18	1.60	0.95	0.46	2.23
	p		0.28	0.15	0.37	0.66	0.04
GP/PT	t		-0.32	-0.57	-1.02	-1.26	0.23
	p		0.76	0.58	0.33	0.24	0.83
Pooled Groups							
	X	5.83	6.13	6.44	5.87	5.73	7.00
	SD	1.13	1.13	0.73	1.13	1.39	0.00
	N	24	15	9	15	15	9

* significant at p = 0.20

Ability Scales 1 = Static Strength
2 = Trunk Strength
3 = Stamina
4 = Extent Flexibility
5 = Dynamic Flexibility
6 = Mobility

TABLE 16

MEDICAL STANDARDS DATA PREVIOUS LOW BACK PAIN
CATEGORY B

Statistic		Ability Scale 1	2	3	4	5	6
Ortho/Neuro	X	3.89	3.89	4.67	3.78	4.11	4.89
	SD	0.60	0.60	0.50	0.83	1.05	0.60
Gen. Pract.	X	4.22	3.89	4.33	4.00	3.56	5.00
	SD	0.97	0.78	0.50	1.32	1.01	0.71
Phys. Ther.	X	4.33	4.33	4.00	3.67	4.00	4.00
	SD	0.52	0.52	0.89	0.82	0.63	0.63
ANOVA	F	0.76	1.02	2.13*	0.20	0.83	4.81*
	p	0.48	0.38	0.14	0.82	0.45	0.02
Ortho/GP	t			1.41			-0.36
	p			0.83			0.72
Ortho/PT	t			1.66			2.72
	p			0.14			0.02
GP/PT	t			0.83			2.86
	p			0.43			0.02
Pooled Groups							
	X	4.13	4.00	4.50	3.83	3.88	4.71
	SD	0.74	0.66	0.51	1.01	0.95	0.75
	N	24	24	18	24	24	18

* significant at p = 0.20

Ability Scales 1 = Static Strength
2 = Trunk Strength
3 = Stamina
4 = Extent Flexibility
5 = Dynamic Flexibility
6 = Mobility

TABLE 17

MEDICAL STANDARDS DATA PREVIOUS SCIATICA
CATEGORY B

Statistic		Ability Scale 1	2	3	4	5	6
Ortho/Neuro	X	3.89	3.78	4.78	3.78	3.44	4.67
	SD	0.93	0.67	1.39	1.09	0.88	1.00
Gen. Pract.	X	3.56	3.56	3.89	3.44	3.67	4.78
	SD	0.73	0.88	0.78	1.01	1.00	0.83
Phys. Ther.	X	3.83	3.67	4.17	3.83	3.17	4.00
	SD	0.98	0.52	0.98	0.98	0.75	0.63
ANOVA	F	0.37	0.21	1.53	0.34	0.56	1.62
	p	0.70	0.81	0.24	0.72	0.58	0.22
Ortho/GP	t						
	p						
Ortho/PT	t						
	p						
GP/PT	t						
	p						
Pooled Groups							
	X	3.75	3.67	4.29	3.67	3.46	4.54
	SD	0.85	0.70	1.12	1.01	0.88	0.88
	N	24	24	24	24	24	24

* significant at p = 0.20

Ability Scales 1 = Static Strength
2 = Trunk Strength
3 = Stamina
4 = Extent Flexibility
5 = Dynamic Flexibility
6 = Mobility

TABLE 18

MEDICAL STANDARDS DATA PREVIOUS SURGERY
CATEGORY B

Statistic		Ability Scale 1	2	3	4	5	6
Ortho/Neuro	X	3.67	3.67	4.00	3.56	3.78	3.89
	SD	0.71	1.12	1.41	0.88	1.20	0.60
Gen. Pract.	X	3.44	3.33	3.67	3.22	3.44	4.22
	SD	0.88	1.23	0.87	1.09	1.24	1.20
Phys. Ther.	X	4.17	3.67	4.33	3.50	3.50	3.67
	SD	0.75	0.52	0.82	0.55	0.55	0.52
ANOVA	F	1.53	0.28	0.67	0.34	0.23	0.79
	p	0.24	0.76	0.52	0.72	0.80	0.47
Ortho/GP	t						
	p						
Ortho/PT	t						
	p						
GP/PT	t						
	p						
Pooled Groups							
	X	3.71	3.54	3.96	3.42	3.58	3.96
	SD	0.81	1.02	1.08	0.88	1.06	0.86
	N	24	24	24	24	24	24

* significant at p = 0.20

Ability Scales 1 = Static Strength
2 = Trunk Strength
3 = Stamina
4 = Extent Flexibility
5 = Dynamic Flexibility
6 = Mobility

TABLE 19

MEDICAL STANDARDS DATA SCOLIOSIS
CATEGORY B

Statistic		Ability Scale 1	2	3	4	5	6
Ortho/Neuro	X	3.89	4.00	4.78	4.11	3.67	4.56
	SD	1.05	0.87	0.67	1.27	1.00	0.88
Gen. Pract.	X	3.78	3.44	3.67	3.33	3.22	4.00
	SD	1.09	1.24	0.87	1.23	1.30	0.87
Phys. Ther.	X	4.00	3.50	4.17	3.67	3.50	3.67
	SD	0.63	1.05	0.98	0.82	0.84	1.03
ANOVA	F	0.09	0.71	4.06*	1.02	0.38	1.84*
	p	0.91	0.50	0.03	0.38	0.69	0.18
Ortho/GP	t			3.05			1.35
	p			0.01			0.20
Ortho/PT	t			1.33			1.73
	p			0.22			0.12
GP/PT	t			-1.01			0.65
	p			0.34			0.53
Pooled Groups							
	X	3.88	3.67	4.53	3.71	3.46	4.28
	SD	0.95	1.05	0.83	1.16	1.06	0.90
	N	24	24	15	24	24	18

* significant at p = 0.20

Ability Scales 1 = Static Strength
2 = Trunk Strength
3 = Stamina
4 = Extent Flexibility
5 = Dynamic Flexibility
6 = Mobility

TABLE 20

MEDICAL STANDARDS DATA SPONDYLOLISTHESIS
CATEGORY B

Statistic		Ability Scale 1	2	3	4	5	6
Ortho/Neuro	X	4.00	4.11	4.67	4.11	3.67	4.89
	SD	0.71	0.60	0.87	0.78	1.00	0.60
Gen. Pract.	X	3.67	3.56	4.00	3.56	3.11	4.00
	SD	1.00	0.88	0.87	1.13	1.17	1.41
Phys. Ther.	X	3.67	3.50	3.67	3.50	2.83	4.00
	SD	1.03	1.05	0.82	1.38	0.98	1.41
ANOVA	F	0.38	1.36	2.74*	0.81	1.23	1.62
	p	0.69	0.28	0.09	0.46	0.31	0.22
Ortho/GP	t			1.63			
	p			0.12			
Ortho/PT	t			2.27			
	p			0.04			
GP/PT	t			0.76			
	p			0.47			
Pooled Groups							
	X	3.72	3.75	4.67	3.75	3.25	4.33
	SD	0.88	0.85	0.87	1.03	1.07	1.20
	N	24	24	9	24	24	24

* significant at p = 0.20

Ability Scales 1 = Static Strength
2 = Trunk Strength
3 = Stamina
4 = Extent Flexibility
5 = Dynamic Flexibility
6 = Mobility

TABLE 21

MEDICAL STANDARDS DATA PREVIOUS LOW BACK PAIN
CATEGORY C

Statistic		Ability Scale 1	2	3	4	5	6
Ortho/Neuro	X	1.89	2.00	2.67	2.11	2.22	3.00
	SD	0.33	0.87	1.00	0.78	1.39	1.22
Gen. Pract.	X	2.00	2.44	2.33	2.22	1.67	2.67
	SD	0.71	0.53	0.50	0.83	0.71	1.23
Phys. Ther.	X	2.00	2.00	2.17	2.00	1.67	2.17
	SD	0.63	0.89	0.75	0.63	0.82	0.75
ANOVA	F	0.11	0.95	0.82	0.15	0.80	0.98
	p	0.90	0.40	0.46	0.86	0.46	0.39
Ortho/GP	t						
	p						
Ortho/PT	t						
	p						
GP/PT	t						
	p						
Pooled Groups							
	X	1.96	2.17	2.42	2.13	1.88	2.67
	SD	0.55	0.76	0.78	0.74	1.04	1.13
	N	24	24	24	24	24	24

* significant at p = 0.20

Ability Scales 1 = Static Strength
2 = Trunk Strength
3 = Stamina
4 = Extent Flexibility
5 = Dynamic Flexibility
6 = Mobility

TABLE 22

MEDICAL STANDARDS DATA PREVIOUS SCIATICA
CATEGORY C

Statistic		Ability Scale 1	2	3	4	5	6
Ortho/Neuro	X	2.22	2.11	2.78	2.44	1.78	2.67
	SD	0.67	0.78	1.86	1.13	0.67	1.41
Gen. Pract.	X	2.11	2.22	2.11	2.00	2.00	2.67
	SD	0.60	0.67	0.78	0.50	0.71	0.87
Phys. Ther.	X	2.00	2.17	2.17	2.17	1.83	2.00
	SD	0.89	0.41	0.75	0.75	0.98	0.89
ANOVA	F	0.18	0.06	0.70	0.63	0.20	0.81
	p	0.84	0.94	0.51	0.54	0.82	0.46
Ortho/GP	t						
	p						
Ortho/PT	t						
	p						
GP/PT	t						
	p						
Pooled Groups							
	X	2.13	2.17	2.38	2.21	1.88	2.50
	SD	0.68	0.64	1.28	0.83	0.74	1.10
	N	24	24	24	24	24	24

* significant at p = 0.20

Ability Scales 1 = Static Strength
2 = Trunk Strength
3 = Stamina
4 = Extent Flexibility
5 = Dynamic Flexibility
6 = Mobility

TABLE 23

MEDICAL STANDARDS DATA PREVIOUS SURGERY
CATEGORY C

Statistic		Ability Scale 1	2	3	4	5	6
Ortho/Neuro	X	1.78	2.33	2.44	2.11	2.00	2.00
	SD	0.67	1.50	1.59	0.78	0.71	0.71
Gen. Pract.	X	2.00	2.00	2.11	1.89	2.00	1.78
	SD	0.71	0.71	0.78	0.78	1.00	0.67
Phys. Ther.	X	2.00	1.83	1.83	2.00	1.83	2.00
	SD	0.89	0.75	0.98	0.63	0.75	0.63
ANOVA	F	0.25	0.42	0.49	0.20	0.09	0.31
	p	0.78	0.66	0.62	0.82	0.92	0.74
Ortho/GP	t						
	p						
Ortho/PT	t						
	p						
GP/PT	t						
	p						
Pooled Groups							
	X	1.92	2.08	2.17	2.00	1.96	1.92
	SD	0.72	1.06	1.17	0.72	0.81	0.65
	N	24	24	24	24	24	24

* significant at p = 0.20

Ability Scales 1 = Static Strength
2 = Trunk Strength
3 = Stamina
4 = Extent Flexibility
5 = Dynamic Flexibility
6 = Mobility

TABLE 24

MEDICAL STANDARDS DATA SCOLIOSIS
CATEGORY C

Statistic		Ability Scale 1	2	3	4	5	6
Ortho/Neuro	X	2.11	2.33	2.78	2.44	2.11	2.78
	SD	0.60	0.87	1.20	1.42	0.93	1.48
Gen. Pract.	X	2.22	2.00	2.11	1.89	2.00	2.11
	SD	0.83	0.87	0.60	0.78	1.00	0.60
Phys. Ther.	X	2.17	2.33	2.50	2.00	2.00	2.00
	SD	0.41	0.82	1.05	0.63	0.89	0.63
ANOVA	F	0.06	0.43	1.06	0.69	0.04	1.35
	p	0.94	0.66	0.36	0.51	0.96	0.28
Ortho/GP	t						
	p						
Ortho/PT	t						
	p						
GP/PT	t						
	p						
Pooled Groups							
	X	2.17	2.21	2.46	2.13	2.04	2.33
	SD	0.64	0.83	0.98	1.04	0.91	1.05
	N	24	24	24	24	24	24

* significant at p = 0.20

Ability Scales 1 = Static Strength
2 = Trunk Strength
3 = Stamina
4 = Extent Flexibility
5 = Dynamic Flexibility
6 = Mobility

TABLE 25

MEDICAL STANDARDS DATA SPONDYLOLISTHESIS
CATEGORY C

Statistic		Ability Scale 1	2	3	4	5	6
Ortho/Neuro	X	2.33	2.22	2.67	2.22	2.22	3.00
	SD	0.87	0.67	1.12	0.67	1.09	1.50
Gen. Pract.	X	2.00	2.22	2.11	2.00	1.44	2.11
	SD	0.87	0.83	0.60	0.71	0.53	0.78
Phys. Ther.	X	1.83	2.00	1.83	1.83	1.67	2.00
	SD	0.75	1.27	0.75	0.75	0.82	0.89
ANOVA	F	0.71	0.14	1.86*	0.58	1.98*	1.93*
	p	0.50	0.87	0.18	0.57	0.16	0.17
Ortho/GP	t			1.31		1.92	1.58
	p			0.21		0.08	0.14
Ortho/PT	t			1.73		1.13	1.62
	p			0.11		0.28	0.13
GP/PT	t			0.76		-0.59	0.25
	p			0.47		0.57	0.81
Pooled Groups							
	X	2.08	2.17	2.39	2.04	2.00	3.00
	SD	0.83	0.87	0.92	0.69	1.00	1.50
	N	24	24	18	24	15	9

* significant at p = 0.20

Ability Scales 1 = Static Strength
2 = Trunk Strength
3 = Stamina
4 = Extent Flexibility
5 = Dynamic Flexibility
6 = Mobility

eliminate either the general practitioner group or the

physical therapy group from the pooled results. The alpha level for significance in both the F test and the t test was p = 0.20. In certain cases only the results of the orthopedic and neurologic surgeons group were used in the creation of the final threshold results. Therefore, the final threshold values for the medical standards were based upon a minimum N of 9, with a possible maximum N of 24. A complete listing of the data for this section may be found in Appendix H.

On review of the data, it was noted that 66 or 73 % of the returns allowed the results from all three of the health care professional groups to be pooled. Of the remaining scales, 5 or 6 % demonstrated a significant difference between the orthopedic/neurologic surgeons group and both of the other groups, dictating the use of the results from the reference group only. The physical therapy group only, was combined with the orthopedic/neurologic surgeons group on 14 % of the values, while the general practitioners group was combined with the orthopedic/neurologic surgeons group on 6 % of the values. Therefore, the physical therapy group agreed with the orthopedic/neurologic surgeons group 89 % of the time, while the general practitioners group agreed with the orthopedic/neurologic surgeons group 79 % of the time.

Once the means of the groups were obtained, the values

were rounded to one decimal point to facilitate ease of use and comparison with the nursing ability data. The final medical standard threshold values for the entire 90 scales are recorded in Tables 26-30.

Following the medical standards results, the threshold values for all 6 nursing ability scales are recorded in Table 31. Again, these values were rounded off to the first decimal point for ease of use and comparison.

D. SUMMARY AND DISCUSSION OF RESULTS

Nursing demographic data. While not directly addressed by the research questions of this study, the information obtained in the demographic responses of the nurses presents the opportunity for reflection. Many of the nursing staff could be accurately termed obese (35 %). Addressing back disability specifically, 20 % of the respondents reported a history of an on-the-job injury to their lower back, and an additional 18 % reported loss of work due to back pain. Further, 39 % of the nurses note some experience with back pain such that it limited their functioning in some manner. These results demonstrate a definite need for further assessment, and would seem to offer the opportunity for health promotion and behavioral modification to prevent further pathology.

TABLE 26

MEDICAL STANDARDS THRESHOLD VALUES
PREVIOUS LOW BACK PAIN

Ability Scale	Category A Standard 1	Category B Standard 2	Category C Standard 3
1. Static Strength	6.5	4.1	2.0
2. Trunk Strength	6.2	4.0	2.2
3. Stamina	6.6	4.5	2.4
4. Extent Flexibility	6.5	3.8	2.1
5. Dynamic Flexibility	5.8	3.9	1.9
6. Mobility	6.8	4.7	2.7

TABLE 27

MEDICAL STANDARDS THRESHOLD VALUES
PREVIOUS SCIATICA

Ability Scale	Category A Standard 4	Category B Standard 5	Category C Standard 6
1. Static Strength	6.0	3.8	2.1
2. Trunk Strength	6.1	3.7	2.2
3. Stamina	5.8	4.3	2.4
4. Extent Flexibility	5.8	3.7	2.2
5. Dynamic Flexibility	5.4	3.5	1.9
6. Mobility	6.3	4.5	2.5

TABLE 28

MEDICAL STANDARDS THRESHOLD VALUES
PREVIOUS SURGERY

Ability Scale	Category A Standard 7	Category B Standard 8	Category C Standard 9
1. Static Strength	5.2	3.7	1.9
2. Trunk Strength	5.9	3.5	2.1
3. Stamina	5.6	4.0	2.2
4. Extent Flexibility	5.8	3.4	2.0
5. Dynamic Flexibility	5.2	3.6	2.0
6. Mobility	6.0	4.0	1.9

TABLE 29

MEDICAL STANDARDS THRESHOLD VALUES
SCOLIOSIS

Ability Scale	Category A Standard 10	Category B Standard 11	Category C Standard 12
1. Static Strength	6.2	3.9	2.2
2. Trunk Strength	6.1	3.7	2.2
3. Stamina	6.4	4.5	2.5
4. Extent Flexibility	5.9	3.7	2.1
5. Dynamic Flexibility	5.2	3.5	2.0
6. Mobility	6.3	4.3	2.3

TABLE 30

MEDICAL STANDARDS THRESHOLD VALUES
SPONDYLOLISTHESIS

Ability Scale	Category A Standard 13	Category B Standard 14	Category C Standard 15
1. Static Strength	5.8	3.8	2.1
2. Trunk Strength	6.1	3.8	2.2
3. Stamina	6.4	4.7	2.4
4. Extent Flexibility	5.9	3.8	2.0
5. Dynamic Flexibility	5.7	3.3	2.0
6. Mobility	7.0	4.3	3.0

TABLE 31

NURSING ABILITY SCALES THRESHOLD VALUES

Ability Scales	Threshold Value
1. Static Strength	5.7
2. Trunk Strength	3.6
3. Stamina	5.5
4. Extent Flexibility	2.7
5. Dynamic Flexibility	3.8
6. Mobility	3.5

Nursing abilities analysis. The ability scales as developed by Fleishman (1975, 1978, 1979), appear to be very easily understood and present little difficulty in completion. This is supported by this study's low nonusable response rate of 7 %. The actual return rate of 33 % for an anonymous voluntary survey, such as used in this study, is quite reasonable. A higher return rate could have been obtained using techniques such as coded survey forms and multiple distributions, a somewhat more coercive wording of the cover letter, and a closer interaction with the individuals filling out the scales. However, it was felt that these methods might limit or bias the returns due to the rather sensitive nature of the implications of the study. In the actual use of these scales in an occupational

setting, the employer might be able to exercise more control over the returns, as long as confidentiality was guaranteed. The time required for completion of the scales was minimal, thus supporting their use in a wide range of occupational situations. The vast diversity of job descriptions currently in existence mandate this fact in any practical job analysis technique.

One problem which arose in this study was the attempt to create nurse-specific behavioral anchors for the ability scales. The advantages of having occupationally-oriented anchors would appear to be obvious, however, the experience of this study suggests otherwise. The time required for this aspect of the job analysis could be prohibitively long, given the wide variation in job types. Further, despite close discussions with nursing supervisors, difficulties still arose with the production of these anchors. For ease of usage, it would seem to be more appropriate to use the generic behavioral anchors as produced by Nylander and Carmean (1987). This would facilitate the general application of this methodology to all types of employment situations, since these anchors have already been validated through past testing.

This study utilized a relatively large number of nurses to complete the scales, requiring extensive logistical commitment. One method of circumventing this fact is to

survey only supervisory staff, on the basis of more manageable numbers and ease of communication. This study demonstrated the lack of significant differences in ability scale assessment between staff nurses and nurse supervisors, as noted in Table 10. Further, there appeared to be greater agreement between supervisors than between staff nurses. This fact is supported by the greater standard deviations of the staff nurses' response scores when compared with those of the nursing supervisors. This data may be found in Appendix G. Therefore, if supervisory personnel are able to accurately assess the line workers situation, the need for surveying the individual workers is obviated. It would be possible to gather a group of supervisors together to fully instruct them in the completion of the scales, and produce the finished scales, all at one meeting.

Medical standards development. A high level of response was obtained in this section of the study primarily due to the one-on-one method of presentation and review of the instructions. Further, the researcher's involvement in the practice of medicine simplified the obtaining of persons who would agree to complete the scales. However, this method was extremely time consuming, despite the fact that only 5 medical problems in 3 categories were addressed by only 6 scales. For this methodology to be expanded to a

scaling process which would involve other medical problems and other body systems, a different technique will have to be utilized. A scenario similar to that proposed for the nursing ability scale section would hold promise. A one-time meeting of all the physicians, at which the instructions could be presented and the scales completed, could simplify the process greatly. This would insure the uniformity of instructions and shorten the time required for development. A simpler method of arriving at the desired medical standards would be to utilize the values already developed and validated by Nylander and Carmean (1987). The lack of detailed data from their published results prevented a specific comparison with the data of this present study, however, an overview of the values showed them to be comparable. The only problem which might arise using this technique is the loss of specificity for the local area and local standards of medical care. This is a requirement which may be looked for by the judicial system if the usage of this methodology is ever challenged in court. One of the primary reasons for conducting this study was to develop standards and scale results which would be specific for The University of Tennessee Medical Center at Knoxville and probably the East Tennessee area.

In summation, this study offers several areas of application for the results obtained. Demographic

information has provided data to support the need for behavioral intervention in this nursing population. The evidence for existing pathology and the portent for future disability is apparent. It is highly probable that most of the nurses surveyed in this study were hired with the problems of obesity and lower back dysfunction already present. Neither of these problems being an exclusionary variable for employment, the stage was set for further disability, suffering, lost time and worker's compensation claims. Given the increasingly prohibitive costs of worker disability and the genuine altruistic desires of society to reduce suffering, an imperative is created to improve the specificity of job placements and to affect changes in the risk variables of existing employees. Of major importance in this process is the development of a job analysis which adequately reflects the physical stresses of the occupational situation. The present study supports the usability of the abilities analysis for this purpose. Implementation of this type of analysis using the techniques suggested by this study, will provide previously unavailable information to the physician and thus increase the validity of the preplacement and disability examination. Of equal importance in this setting is the use by the medical practitioner of consensus medical standards for problem areas discerned from an employee's health history and

physical examination. The development of such standards as outlined in this study will enable the physician to easily include the expert evaluation of other practitioners in his or her assessment of any given individual. The desired result of the combination of both the job analysis and the medical standards will be the more precise placement and evaluation of the worker in the occupational setting. Concrete data such as these will expedite the decision making process and lessen the need for costly consultation and legal arbitration. The medical practitioner would be more likely to make a stand on the employability of an individual as a result of this type of data, since his or her medical and legal position is more established and supported. From a purely legal point of view, the methods outlined in this study would appear to fulfill the various requirements dictated by the precedents noted earlier. The specificity of the job analysis coupled with the opinions of several medical experts should provide the necessary validation of this process for preplacement and disability evaluation such that any decision based upon it would withstand legal scrutiny. Finally, a major result of the implementation of this type of methodology would be the heightened awareness of both the medical and business community of the relationship between predisposing risk factors and subsequent disability in the workplace.

CHAPTER V

CONCLUSIONS

This chapter presents an overview of the research presented in this study. It begins with a review of the purpose of the investigation, followed by a brief discussion of the methodology utilized in its completion. The specific findings are summarized next, with a section detailing the study's conclusions, and finally a section presenting the recommendations of the project.

A. SUMMARY OF PURPOSE AND METHODOLOGY

Purpose of the study. The purpose of the research was to develop a job-specific abilities analysis for nurses, and to compile medical standards for disability assessment based upon the abilities analysis, relevant to The University of Tennessee Medical Center at Knoxville.

Importance of the study. Increasingly, physicians are being asked to assess the degree of ability or disability of an individual in respect to an employment situation. The knowledge base with which the medical practitioner enters into this assessment, is frequently a limiting factor in its

actual precision. This difficulty stems from a dearth of information concerning the job requirements, and a lack of a medical standard or consensus regarding allowable stress. Given the dramatic increase in work-related disability and worker's compensation costs, the advantages of making an appropriate job placement decision are obvious. In an attempt to assist in the solution to this problem, this study sought to answer the following questions:

1. Can a task-oriented abilities analysis profile be produced for the Department of Nursing Services at The University of Tennessee Medical Center at Knoxville?

2. Can an abilities-specific, medical standards profile for back problems, be produced for this department?

3. Is there a significant difference between the abilities scale ratings of nursing supervisors and staff nurses?

4. Is there a significant difference between the medical standards ratings of a group of orthopedic and neurologic surgeons, a group of general practitioners and a group of physical therapists?

Methodology. Of 735 nurses presented with the study packet, 242 completed and returned the survey consisting of six ability scales and a demographic information sheet. The results of the ratings were assessed for internal

consistency and a mean was calculated for each scale. The means so calculated were viewed as representing the threshold values of greatest physical stress undertaken by nurses for each of the six ability areas. A comparison was made between the ratings of the staff nurses and the ratings of a sub-group of nursing supervisors to determine the similarity of the two groups.

Next, a group of 24 physicians and physical therapists completed a survey consisting of ratings for five medical problem areas in three categories of symptomatology for each of the same six ability scales as in the nursing survey. Means were calculated for each of the 90 resultant scales and these were viewed as representing the threshold values of greatest allowable physical stress for each of the six ability scales within the bounds of the given medical problems. To arrive at the final value for each mean, a comparison was made between the ratings for each of three sub-groups of the physician/physical therapist population. Using the group of orthopedic and neurologic surgeons as the reference group, the ratings of the general practitioner group and the physical therapists group were compared with the ratings of the orthopedic/neurologic surgeons group to determine any significant difference in their means. If no significant difference was found, the rating results were pooled to arrive at the final threshold values.

B. FINDINGS

Nursing abilities analysis.

1. A history of on-the-job injury to the low back was reported by 20 % of the nurses.

2. Back pain associated with limitation in function was noted by 39 % of the nurses, while 18 % reported back pain associated with lost work time.

3. Height and weight data indicated that 35 % of the nurses could be considered obese.

4. A low rate of rejection of the returned surveys of 7 % would support the ease of use of the abilities scales.

5. The creation of nurse-specific behavioral anchors for the ability scales was viewed as being less suited to assist in the rating of the scales than the original more generic anchors as produced by the developers of the scaling instrument.

6. The internal consistency of the scaling instrument was supported by the findings of no significant differences between randomly selected halves of the data.

7. The ability scales are easily completed and analyzed, thus rapidly generating job-specific threshold values for use in preplacement and disability assessments.

8. No significant differences were found between the results of the nursing staff population and the results of

the nursing supervisors.

Medical standards development.

9. No surveys returned by the physicians or physical therapists had to be rejected due to completion errors, thus supporting the simplicity of completion and the understandability of the instructions.

10. The time required for distribution, completion and instructional support of this step of the study necessitated a protracted commitment which limited the ease of use of the medical standards survey.

11. Comparison of the results of the orthopedic and neurologic surgeons group, the general practitioners group and the physical therapists group, demonstrated agreement between the orthopedic/neurologic surgeons group and the general practitioners group on 79 % of the scales, and agreement between the orthopedic/neurologic surgeons group and the physical therapists group on 89 % of the scales.

12. After completion of the surveys, analysis of the results is a simple procedure, rapidly generating threshold medical standards of allowable physical stress for use in preplacement and disability assessment.

C. CONCLUSIONS

1. A task-oriented abilities analysis profile of the physical stress experienced by nurses in six physical ability areas, was produced for the Department of Nursing Services at The University of Tennessee Medical Center at Knoxville.

2. An abilities-specific, medical standards profile for back problems, covering six physical ability areas, was produced for the Department of Nursing Services at the University of Tennessee at Knoxville.

3. Supervisory personnel are able to assess the physical stresses required by nurses in their job on an equal level with the line personnel.

4. General practitioners and physical therapists were not found to assess allowable physical stress on an equal level with orthopedic and neurologic surgeons.

5. There is a need for educational and behavioral programs in the areas of obesity and care of the lower back in this nursing population.

D. RECOMMENDATIONS

1. Health promotion activities should be implemented in the areas of weight control and back care for this

nursing population.

2. The abilities analysis methodology is recommended as a usable adjunct in the complete job analysis of the nursing population at The University of Tennessee Medical Center at Knoxville.

3. It is recommended that supervisory personnel rather than line personnel be utilized for abilities analysis scale completion.

4. Due to the time and logistical constraints required in the completion of the medical standards survey, it is recommended that The University of Tennessee Medical Center at Knoxville adopt the usage of one of the medical standards profiles already in existence.

5. If medical standard development is a requirement in the future, it is recommended that specialty-specific physicians be utilized based upon the incidence of significant differences between the reference and nonreference groups in this study.

6. For actual scale and profile development, it is recommended that one-time general meetings for instructions and completion of scales be performed to enhance accuracy and facilitate returns.

7. It is recommended that an abilities-specific job analysis and an abilities-specific medical standards profile

be incorporated as an adjunct in the preplacement and disability assessment of workers by physicians.

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APPENDICES

APPENDIX A

NURSING TASK LIST

NURSING TASK LIST

Cluster 1 - Level 1.

Provide oral hygiene

Measure urine sugar and acetone

Assess body weight

Use reality orientation in a one-on-one interaction

Measure urine specific gravity

Plan appropriate bed positioning for disabled client

Implement suicide precautions

Identify equipment needs

Place client in isolation

Transport an isolated client

Prepare a reality orientation class

Perform passive range of motion exercise

Feed client via nasogastric feeding tube

Position disabled client in bed

Prepare written minutes of meetings

Apply an external catheter to male client

Transfer disabled client from bed to chair

Maintain clients indwelling catheter

Collect a urine specimen

Assess intake and output

Administer a cleansing enema

Promote normal bladder function

Measure intake and output

Initiate process for placing client in isolation

Lead a reality orientation class

Remove a stool impaction

Implement client infection precautions

Prepare written communication

Provide care for client with nasogastric tube hooked to suction

Plan an individual reality orientation program

Perform gastric lavage

Plan transfer of client from bed to chair

Cluster 1 - Level 2.

Insert a nasogastric tube

Promote normal bowel function

Plan a staff recognition program

Develop a nurse orientation program

Evaluate institutional policies and standards by group process

Plan for passive range of motion

Insert urinary catheter in female patient

Assess lochia

Determine eligibility of domestic nurse graduate for nursing licensure

Establish plan of care to maintain skin integrity

Administer alcohol or tepid sponge bath

Perform cardiopulmonary resuscitation

Assess the client's bowel function

Insert urinary catheter in male client

Develop plan for assessment of the breasts

Perform physical assessment of perineum

Use a hypo- or hyperthermia blanket

Assess the breasts of a postpartum client

Provide alternate methods of communication for client with verbal communication deficit

Promote normal hydration

Write behavioral objectives for nursing administration

Perform a back rub

Participate as a member of a committee

Perform physical assessment of uterine fundus

Assess suicidal behavior

Develop plan for assessing the uterine fundus

Develop plan for assessing lochia

Develop plan for assessing the perineum

Maintain intermittent intravenous infusion of fluid/medication

Assess maternal-infant attachment

Change sterile dressing

Implement the consultative process

Write a nursing standard

Prepare a nursing service budget

Develop a test blueprint

Develop a plan for assessing the neurological status of a patient

Develop a plan for nurse retention

Establish committees

Clean incisional button or tractional pins

Teach a client how to bathe a baby

Teach a client perineal self-care

Implement a decision

Develop a plan to teach a client how to bathe a baby

Monitor a nursing budget

Schedule educational activities

Determine eligibility for registration as an advanced registered nurse practitioner

<u>Cluster 1 - Level 3.</u>

Start an intravenous infusion

Develop a plan to teach a client to perform a breast self-examination

Teach a client breastfeeding

Obtain an electrocardiographic reading

Issue an order

Teach a client how to bottle feed a baby

Implement a nursing referral

Make a decision

Develop a plan to teach perineal self-care

Teach a client how to perform a breast self-examination

Administer total parenteral nutrition

Coordinate the activities of others

Maintain continuous peripheral intravenous therapy

Prepare correspondence

Develop a philosophy of nursing service

Develop course content

Recruit students

Administer an intramuscular, intradermal or subcutaneous injection

Develop a plan to teach a client breastfeeding

Obtain a sexual history

Obtain a blood pressure reading

Assign workloads to personnel

Assess pulse presence, rate, volume, and rhythm

Assess neurological status of client

Initiate client neurological checks

Develop professional, organizational policy/goal

Perform physical assessment of the breasts

Select applicants for admission into a nursing program

Identify outcome characteristics of the graduate of a nursing program

Act as a change agent

Determine eligibility of graduates of foreign nursing school for state board test pool examination/ endorsement licensure

Make recommendations for nursing faculty salary/ promotion/tenure

Write a reference

Write the delimitations for nursing research

Initiate under water seal chest drainage

Assess heart sounds

Determine quota of nursing program admissions

Determine eligibility of a domestic nurse graduate for nursing licensure by endorsement

Schedule activities, meetings, workshops, conferences

Assess the need for a course

Auscultate lung sounds

Assess client cardiopulmonary status via a Swan Ganz reading

Use cutaneous stimulation for pain control

Develop an essay test question

Develop a plan of care for a client with a Blakemore tube

Assess peripheral circulation

Write purpose statement for nursing research

Assist a client to select a contraceptive method

Determine eligibility for nursing licensure of applicants with criminal conviction records

Obtain consent to implement data collection in nursing research

Assess rate, regularity, effort/depth of respirations

Teach a client about sexually transmitted diseases

Seek funding sources for nursing research

Select library holdings for unit in nursing

Define terms for nursing research

Assess emotional status of client

Suction the airway

Develop a plan for bladder retraining

Prepare information about nursing program for publication

Teach a client about contraceptive methods

Defibrillate a client

Develop strategies for conflict resolution

Develop a plan for change

Recruit faculty members

Prepare collected research data for analysis

<u>Cluster 1 - Level 4.</u>

Prepare an objective test

Prepare a bibliography for a specific nursing course

Develop a plan to promote optimal cardiac function

Develop faculty and administrative job descriptions

Assist with problem solving during counseling

Develop a course proposal

Ventilate a client with a mechanical ventilator

Select an appropriate teaching strategy

Develop a plan for bowel retraining

Cluster 2 - Level 1.

Conduct conference

Develop a grading system for courses in nursing

Write the limitations of nursing research

Plan a conference

Ventilate a client with a hand ventilator

State nursing research problem

Schedule disciplinary hearings before the nursing regulatory board

Conduct professional development programs

Develop process and procedure for human rights protection

Act as a client advocate

Develop a plan to ensure adequate ventilation

Cluster 2 - Level 2.

Employ nurse staff

Prepare report on complaints about registered nurses and licensed practical nurses

Assess the need for suctioning the airway

Write nursing research questions and/or hypothesis(es)

Prevent injury during a grand mal seizure

Select a data collection tool

Disseminate the nursing research report

Select strategies for achieving outcome objectives

Develop a staffing pattern

Write behavioral objectives for nursing course

Write the assumptions for the nursing research

Write behavioral objectives for a learner to achieve specific outcomes

Delegate task(s)

Evaluate student progress through nursing program

Develop admission criteria for nursing program

Select population for nursing research

Select audio-visual materials

Establish a quality assurance program

Select student clinical learning experiences

Assist client to cope with anxiety

Prepare budget for nursing education unit

Provide individual psychotherapy

Interpret statistical nursing research data

Conduct a literature review

Meet requirements of regulating body

Develop a course outline

Provide family psychotherapy

Investigate complaints related to professional nursing practice

Validate data collection tool

Perform crisis intervention

Recommend candidate for faculty appointment

Conduct a performance appraisal

Provide group psychotherapy

Critique nursing research report

Assess compliance of licensees with terms of probation

Select clinical sites for nursing courses

Evaluate behavioral changes

Write nursing procedures

Assess learner readiness

Dismiss students for nursing program

Prepare budget of expenses for nursing research project

Develop an objective test question

Select teaching aids

Write a nursing service policy

Develop an organizational chart

Develop course evaluation tool

Evaluate outcome objective(s)

Write a scholarly work for publication

Write a job description

Develop a data collection tool

Collect nursing research data

Cluster 2 -Level 3.

Write a grant/contract proposal

Implement strategies for grievance

Analyze nursing research data

Use distraction for pain control

Develop a philosophy of nursing education

Develop bylaws for unit in nursing

Write a nursing job specification

Plan a staff development program

Select the method for conducting nursing research

Assist the client to relax systematically

Prepare legal agreements and/or contracts with community health facilities

Conduct an exit interview

Develop a nursing curriculum

Develop a conceptual framework

Develop a theory of nursing

Evaluate facilities, resources, and services of nursing curriculum

Evaluate admissions process of nursing program

Assess client's need for oxygen therapy

Develop a plan to assist client to sleep

Evaluate nursing program via follow-up survey of employees

Plan for management of sensory overload

Develop a plan for pain control

Evaluate nursing job descriptions

Cluster 3.

Conduct peer evaluation of nursing faculty

Develop an evaluation model/plan for nursing program

Identify the learning needs of students

Conduct self-study of nursing program for accreditation

Write a nursing research report

Write proposal for nursing research

Evaluate nursing organization/administration

Evaluate nursing program via survey of graduates

Prepare reports for approval agencies

Prepare reports for governing institution

Plan for management of sensory deprivation

Evaluate nursing curriculum

Conduct summative program evaluation

Prepare site visit reports on institution or unit for accrediting/approval agency

(Lang, 1988, p. 1150-1155).

APPENDIX B

PHYSICAL ABILITIES ANALYSIS

SCALE EXAMPLES

ABILITY SCALE 1. STATIC STRENGTH

This is the ability to use muscle force to lift, push, pull, or carry objects. It is the maximum force that one can exert for a brief period of time.

Requires use of all the muscle force possible to lift, carry, push, or pull a very heavy object.

7 _____ - Lift bags of cement into a truck.

6 _____

5 _____

4 _____ - Pull a sack of mulch across a yard.

3 _____

2 _____

Requires use of a little muscle force to lift, carry, push or pull a light object.

1 _____ - Lift a package of bond paper.

ABILITIES SCALE 2. TRUNK STRENGTH

This ability involves the degree to which one's stomach and lower back muscles can support part of the body repeatedly or continuously over time. The ability involves the degree to which these trunk muscles do not "give out", or fatigue, when they are put under such repeated or continuous strain.

Requires use of all the stomach and lower back muscles to hold up or move part of your body for as long as possible.

7 _____ - Do 100 sit-ups.

6 _____

5 _____

4 _____ - Lay carpet.

3 _____

2 _____

Requires use of a little stomach and lower back muscle force to hold up or move part of your body for a short time.

1 _____ - Sit up in a reclining chair.

ABILITIES SCALE 3. STAMINA

This is the ability to exert oneself physically over a period of time without getting winded or out of breath.

Requires physical activity of the whole body over a long time, with great strain on the heart and blood vessels.

7 _____ - Dig ditches all day.

6 _____

5 _____

4 _____ - Mow a small yard.

3 _____

2 _____

Requires physical activity of the whole body over a short time with little strain on the heart and blood vessels.

1 _____ - Wash a chalkboard.

ABILITIES SCALE 4. EXTENT FLEXIBILITY

This is the ability to bend, stretch, twist or reach out with the body, arms and/or legs.

Requires a high degree of bending, stretching, twisting or reaching out into unusual positions.	7 _____	- Work as a lineman on a utility pole.
	6 _____	
	5 _____	
	4 _____	- Coil up hoses on a fire truck.
	3 _____	
	2 _____	
Requires a low degree of bending, stretching, twisting or reaching out.	1 _____	- Reach for a telephone.

ABILITIES SCALE 5. DYNAMIC FLEXIBILITY

This is the ability to bend, stretch, twist, or reach out with the body, arms and/or legs both quickly and repeatedly.

Requires many fast and repeated body bending, twisting or stretching movements.

7 _____ - Do the butterfly stroke at the olympics.

6 _____

5 _____

4 _____ - Milk cows.

3 _____

2 _____

Requires few repeated bending, twisting or stretching movements where speed is not important.

1 _____ - Collect shells at seashore.

ABILITIES SCALE 6. MOBILITY

The capacity to move one's body from place to place. This capacity does not include accuracy, speed, or precise coordination.

Requires continuous transport of the body in the work place.	7 _____	- Chase a thief on foot.
	6 _____	
	5 _____	
	4 _____	- Work on electrical wiring of a housing project.
	3 _____	
	2 _____	
Requires some body transport for brief periods in the work place.	1 _____	- Work as a telephone operator.

APPENDIX C

INSTRUCTION SHEETS FOR NURSING SUPERVISORS

THE UNIVERSITY OF TENNESSEE
MEMORIAL HOSPITAL

1924 Alcoa Highway
Knoxville 37920-6999
(615) 544-9000

MEMORANDUM

TO: Nursing Directors

FROM: John Turner, M.D.

RE: **Back Disability Medical Standards Project: Nursing Task Review Instructions**

Thank you for agreeing to participate in a research project dealing with the development of medical standards for back disability among nurses. This study, when complete, should produce an assessment instrument which will allow more accurate and valid evaluations of either existing or potential back disabilities. The intent is to aid all parties in the workplace setting, both the employee and the employer. The instrument so developed will be used by examining physicians, and should permit a more informed decision regarding placement in a job setting. Approval has been obtained from the administration of the University of Tennessee Medical center and from nursing administration to proceed with this study. It is a non-threatening, easily performed study, which will eventually involve most of the registered nurses of the Medical Center. The study is totally anonymous. No identification of the individual participant will be required. While you may choose not to participate, only a limited number of these requests are being distributed and a low return rate will affect the validity of the study.

Enclosed with this letter is a list of nursing duties entitled: **Nursing Task List.** This is an extensive compilation of the range of tasks required of nurses in the performance of their jobs. **What is being asked, is that you review this list with attention to the appropriateness of it to nurses working in the Medical Center.** Please list any additional tasks which you feel should be included at the end of the **Nursing Task List.** In particular I am interested in **those tasks which require a high degree of physical exertion.**

All replies are completely confidential. Please do not include your name on the returned list. Any questions which may arise regarding this study should be directed to myself through the nursing office. Please return the completed lists to the nursing office in **two weeks** time. Once again, thank you very much for agreeing to participate in this project.

THE UNIVERSITY OF TENNESSEE
MEMORIAL HOSPITAL

1924 Alcoa Highway
Knoxville 37920-6999
(615) 544-9000

MEMORANDUM

TO: Nursing Directors

FROM: John Turner, M.D.

RE: **Back Disability Medical Standards Project: Nursing Task Selection Instructions**

Continuing with the nursing medical standards project which you began three weeks ago, I have included the Nursing Task List which you reviewed. Also enclosed, are six physical ability scales dealing with specific abilities which would be required of registered nurses working in a hospital setting such as the University of Tennessee Medical Center. Each of the six ability scales has a brief explanation below the heading describing the particular ability under consideration. In addition, there are examples of the types of behavior which may be involved with each ability on the right hand side of the scale.

It is not necessary for you to complete the scales at this time, as this will be required in the final part of this study. What is being asked at this stage, however, is that you **review the Nursing Task List and select one task for each scale which you feel best typifies the specific physical ability under question. I would request that the task which you select should be that task which requires the greatest amount of physical exertion for each ability.** Write the selected task above the scale heading and return the scales to the nursing office.

As with the previous step in this project, all replies will be confidential. Do not include your name on the returned scales. Any questions which may arise regarding this study should be directed to myself through the nursing office. Please return the completed scales to the nursing office in **two weeks** time. Once again, thank you very much for agreeing to participate in this project.

THE UNIVERSITY OF TENNESSEE
MEMORIAL HOSPITAL

1924 Alcoa Highway
Knoxville 37920-6999
(615) 544-9000

M E M O R A N D U M

TO: Head Nurses and Nurse Managers

FROM: John Turner, M.D.

RE: **Back Disability Medical Standards Project: Ability Scale Behavioral Anchor Selection**

Thank you for agreeing to participate in a research project dealing with the development of medical standards for back disability among nurses. This study, when complete, should produce an assessment instrument which will allow more accurate and valid evaluations of either potential or existing back disabilities. The intent is to aid all parties in the workplace setting, both the employee and the employer. The instrument so developed will be used by examining physicians, and should permit a more informed decision regarding placement in a job setting. Approval has been obtained from the administration of the University of Tennessee Medical Center and from nursing administration to proceed with this study. It is a non-threatening, easily performed study, which will eventually involve most of the registered nurses of the Medical Center. This study is totally anonymous. No identification of the individual participant will be required. While you may choose not to participate, only a limited number of these requests are being distributed and a low return rate will affect the validity of the study.

Enclosed with this letter are six scales entitled, Ability Scales. Each of the six scales has a representative nursing task listed beneath a brief explanation of the ability under review. This task represents a nursing duty which requires a high degree of physical exertion specific for the given ability. On the left hand side of each scale are two statements representing the extremes of performance involved with each activity. On the right hand side of the scales are located three examples of behaviors, called **behavioral anchors**, which involve the ability in question. These three **behavioral anchors** are placed on the scale at that point which represents the level of physical exertion required by each behavior. A behavior placed at a scale value of 5 would necessitate greater physical effort than a behavior placed at a scale value of 3.

The behavioral anchors included with the scales as given to you have not been created with a nursing population in mind. What is being asked of you, is that you create new behavioral anchors appropriate to nurses. Replace each of the three given behavioral anchors with three nurse-specific anchors at the same scale level. This will require you to create a total of 18 new behavioral anchors, 3 for each scale. These behavioral anchors are to be used as guides or 'benchmarks' to aid individuals in the completion of the scales. Therefore, simple, brief examples of common behavior are the best. It may be that you feel that the behaviors as they already exist are appropriate, or that they may be made so by just a simple word change. The time required for this activity should be approximately 30 to 45 minutes.

All replies are completely confidential. Please do not include your name on the returned scales. Any questions which may arise regarding this study should be directed to myself through the nursing office. Please return the completed scales to the nursing office in <u>two weeks</u> time. Once again, thank you very much for agreeing to participate in this project.

THE UNIVERSITY OF TENNESSEE
MEMORIAL HOSPITAL

1924 Alcoa Highway
Knoxville 37920-6999
(615) 544-9000

M E M O R A N D U M

TO: Head Nurses and Nurse Managers

FROM: John Turner, M.D.

RE: **Back Disability Medical Standards Project:
Ability Scale Behavioral Anchor Selection - Follow Up**

Thank you for completing and returning the ability scales with your individually created behavioral anchors. In order to select the final form of the ability scale as it will be presented to the entire nursing staff, it is necessary to choose the best examples of the many behavioral anchors which were returned. To this end I have included with this letter the same six ability scales as given to you on the previous occasion. On a separate sheet following each scale is a list of the behavioral anchors submitted. **Please review these behavioral anchors and select the most appropriate example for each of the three scale positions. Indicate your choice by placing an 'X' next to your selection.**

As with the previous stage in this project, all replies will be confidential. Do not include your name on the returned scales. Questions may be directed to myself through the nursing office. PLease return your completed packages to the nursing office in **one weeks** time. Thank you for your continued participation in this project.

APPENDIX D

PHYSICAL ABILITIES ANALYSIS

NURSE SURVEY INSTRUMENT

THE UNIVERSITY OF TENNESSEE
MEDICAL CENTER AT KNOXVILLE

1924 Alcoa Highway
Knoxville 37920-6999
(615) 544-9000

M E M O R A N D U M

TO: UTMCK Registered Nurses

FROM: Jane Hudson, R.N., Associate Administrator / Nursing Services

RE: Back Disability Medical Standards Project

UTMCK is interested in assessing the degree of physical stress placed upon nurses while accomplishing their duties. The enclosed survey has been developed in an attempt to delineate the limits of this physical stress as related to the back. Both the UTMCK administration and myself would appreciate your completing this survey and returning it promptly to your individual head nurse. Thank you very much for your attention to this matter.

THE UNIVERSITY OF TENNESSEE
MEMORIAL HOSPITAL

1924 Alcoa Highway
Knoxville 37920-6999
(615) 544-9000

MEMORANDUM

TO: Registered Nurses UTMC

FROM: John Turner, M.D.

RE: **Back Disability Medical Standards Project: Physical Ability Scale Instructions**

Thank you for agreeing to participate in a research project dealing with the development of medical standards for back disability among nurses. This study, when complete, should produce an assessment instrument which will allow more accurate and valid evaluations of either potential or existing back problems. The intent is to aid all parties in the workplace setting, both the employee and the employer. The instrument so developed will be used by examining physicians to allow for a more informed assessment. Past research has demonstrated that only by a thorough appraisal of the actual physical stresses of a particular job, can the potential for injury be recognized. Approval has been obtained from the administration of the University of Tennessee Medical Center and from nursing administration to proceed with this study. It is a non-threatening, easily performed study, which will eventually involve most of the registered nurses of the Medical Center. This study is totally anonymous. No identification of the individual participant will be required. While you may choose not to participate, the validity of the study will be affected by a low rate of return.

Six physical abilities have been chosen as being involved with activities which produce stress to the low back. **What we would like to know is, how much physical effort do you feel a nurse in your position must expend in each of the six ability areas in order to perform the duties of your profession.**

In order to assess this required effort, six scales have been created corresponding to the six abilities. Each scale has a brief explanation of the particular ability in question located beneath the title. In addition, a specific nursing task has been chosen to provide an example of the type of activity which would utilize this ability.

Each scale consists of a 7 point continuum arranged in an increasing level of exertion, from 1 (low or minimal exertion), to 7 (high or maximum exertion). **It will be your task to select a point on that scale which corresponds to the greatest physical effort required to perform the task selected for each particular ability.** Please note that there is a different task for each of the six abilities. **Choose only one number on each scale by circling that number.**

To aid you in your selection, two sets of reference comments have been included in the scales. On the left hand side of the scale are two Reference Statements representing the extremes of effort required for each ability, with the greatest effort placed at point 7 and the least effort placed at point 1. On the right hand side of the scale are three examples of Behavioral Anchors, placed at specific points on the scale to act as 'benchmarks' in your selection process. **Make your choice regarding the greatest effort required to perform the given task using the Behavioral Anchors as guides.**

The time required for completion of the six scales should be no more than 10 or 15 minutes. In addition to the scales a brief, one page demographic questionnaire is included. Please return your completed packages to your head nurse in **one weeks** time. Any questions which may arise should be addressed to myself through the nursing office. All replies are completely confidential. No one will ever be able to identify any individual with his or her responses. Do not include your name on the returned package. Please answer all parts of the questionnaire and select your responses as accurately as possible. The results of this study will be pooled to give an overall picture of some of the physical effort required by your profession. Once again, thank you for your participation in this project.

ABILITY SCALE 1. STATIC STRENGTH

This is the ability to use muscle force to lift, push, pull, or carry objects. It is the maximum force that one can exert for a brief period of time.

Representative Nursing Task: Lifting patient from bed to a chair.

Performance Extremes **Behavioral Anchors**

Requires use of all the muscle force possible to lift, carry, push or pull a very heavy object.



- Lift bags of cement into a truck.

- Pull a sack of mulch across a yard.

Requires use of a little muscle force to lift, carry, push or pull a light object.

- Lift a package of bond paper.

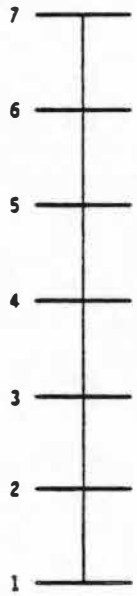
ABILITY SCALE 2. TRUNK STRENGTH

This ability involves the degree to which one's stomach and lower back can support part of the body repeatedly or continuously over time. The ability involves the degree to which these trunk muscles do not "give out" or fatigue, when they are put under such repeated or continuous strain.

Representative Nursing Task: Giving a patient a bed bath.

Performance Extremes **Behavioral Anchors**

Requires use of all the stomach and lower back muscles to hold up or move part of your body, for as long as possible.



- Do 100 sit-ups.
- Lay carpet.
- Sit up in a reclining chair.

Requires use of a little stomach and lower back muscle force to hold up or move part of your body for a short time.

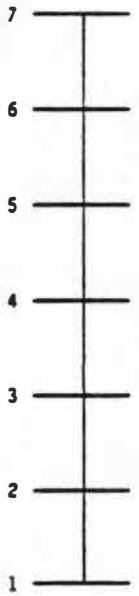
ABILITY SCALE 3. STAMINA

This is the ability to exert oneself physically over a period of time without getting winded or out of breath.

Representative Nursing Task: Cardiopulmonary resuscitation (CPR).

Performance Extremes **Behavioral Anchors**

Requires physical activity of the whole body over a long time, with great strain on the heart and blood vessels.



- Dig ditches all day.

- Mow a small yard.

- Wash a chalkboard.

Requires physical activity of the whole body over a short time, with little strain on the heart and blood vessels.

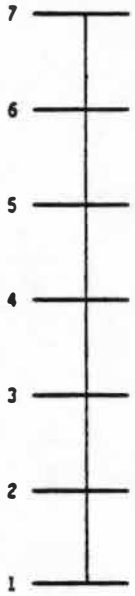
ABILITY SCALE 4. EXTENT FLEXIBILITY

This is the ability to bend, stretch, twist, or reach out with the body, arms and/or legs.

Representative Nursing Task: Start an IV.

Performance Extremes **Behavioral Anchors**

Requires a high degree of bending, stretching, twisting or reaching out into unusual positions.



7 - Work as a lineman on a utility pole.

4 - Coil up hoses on a fire truck.

1 - Reach for a telephone.

Requires a low degree of bending, stretching or reaching out.

ABILITY SCALE 5. DYNAMIC FLEXIBILITY

This is the ability to bend, stretch, twist, or reach out with the body, arms and/or legs both quickly and repeatedly.

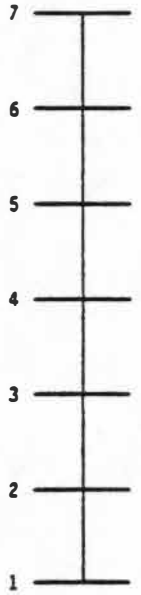
Representative Nursing Task: Passive range of motion exercises.

Performance Extremes

Requires many fast and repeated body bending, twisting or stretching movements.

Requires few repeated bending, twisting or stretching movements, where speed is not important.

Behavioral Anchors



7 - Do the butterfly stroke at the olympics.

4 - Milk cows.

1 - Collect shells at seashore.

ABILITY SCALE 6. MOBILITY

The capacity to move one's body from place to place.
This capacity does not include accuracy, speed or precise coordination.

Representative Nursing Task: Making nursing rounds on patients.

Performance Extremes **Behavioral Anchors**

Requires continuous transport of the body in the work place.



- Chase a thief on foot.

- Work on electrical wiring of a housing project.

- Work as a telephone operator.

Requires some body transport for brief periods in the workplace.

D E M O G R A P H I C D A T A

AGE..... _____

SEX..... _____

HEIGHT IN INCHES..... _____

WEIGHT IN POUNDS..... _____

PREVIOUS HISTORY OF LOW BACK PROBLEMS: YES/NO

PAIN AND LIMITATION ONLY..... _____

PAIN PLUS LOST WORKDAYS..... _____

SURGERY ON LOW BACK..... _____

PREVIOUS EMPLOYMENT HISTORY: YES/NO

LOW PHYSICAL ACTIVITY..... _____

MODERATE PHYSICAL ACTIVITY..... _____

STRENUOUS PHYSICAL ACTIVITY..... _____

LEISURE ACTIVITIES: YES/NO

LOW LEVEL OF PHYSICAL ACTIVITY..... _____

MODERATE LEVEL OF PHYSICAL ACTIVITY..... _____

STRENUOUS PHYSICAL ACTIVITY..... _____

YES/NO

PAST HISTORY OF ON-THE-JOB INJURY OF LOW BACK..... _____

PLEASE INDICATE IF YOU ARE A SUPERVISORY PERSONNEL..... _____
(Head nurse, Supervisor, Manager, Director)

THANK YOU VERY MUCH!

APPENDIX E

MEDICAL STANDARDS DEVELOPMENT

HEALTH CARE PROFESSIONALS

SURVEY INSTRUMENT

THE UNIVERSITY OF TENNESSEE
MEMORIAL HOSPITAL

1924 Alcoa Highway
Knoxville 37920-6999
(615) 544-9000

M E M O R A N D U M

TO: UTMC Physicians

FROM: John Turner, M.D.

RE: **Back Disability Medical Standards Project: Medical Standards Development Instructions**

Thank you for agreeing to participate in this study dealing with physical abilities as they relate to back problems in a nursing population. As you are aware, one of the more difficult problems we are faced with is deciding if and when an individual is medically able to return to work. In an attempt to deal with this problem, this study proposes to relate the degree of physical stress required by nurses in their daily routine, with the allowable stresses dictated by certain medical situations. Our purpose here is to develop the medical standards of acceptable physical effort. After these standards have been produced, they will be distributed to physicians as an adjunct to their evaluation of back disability, to be combined with the more traditional assessment tools of physical examination and X-rays.

The methodology is a simple paper and pencil questionnaire which will be totally anonymous. No identification of the individual participant will be required. While you may choose not to participate, only a limited number of these requests are being distributed and a low return rate will affect the validity of the study.

Six physical abilities have been selected from earlier research on human task performance. These abilities were felt to include physical stresses which may be involved with low back problems. They will be used as classes of behavior for which medical standards of physical effort will be developed. The six abilities so selected are:

1. Static strength
2. Trunk strength
3. Stamina
4. Extent flexibility
5. Dynamic flexibility
6. Mobility

Next, five medical situations were chosen as representative of the many problems which afflict the low back. These five situations are:

1. Previous history of low back pain
2. Previous sciatica
3. Previous surgical procedure on the low back
4. Scoliosis, greater than 30 degrees lumbar, greater than 50 degrees thoracic
5. Spondylolisthesis without surgery

Finally, three categories of impairment were selected to allow for individual variation within the above medical situations. These categories are:

Category A. The individual is totally asymptomatic. They experience no pain or limitation of any kind. They would be evaluated solely on the basis of history and pathology.

Category B. This individual would not experience any type of symptomatology with the activities of daily living. They would experience pain and limitation when performing activities considered more strenuous than those required of daily living, such as jogging one-half mile.

Category C. This individual would experience pain and limitation while performing the simple activities of daily living. Further, they may experience symptoms even at rest.

What is being required of you in this study, is that you assign a value for the degree of greatest physical effort allowable for each physical ability, given each of the medical situations.

In order for you to perform this function, 7-point scales have been developed for each of the six physical abilities. these scales have brief explanations located beneath the title. In addition, to aid you in your selection, two sets of reference comments have been included. On the left hand side of the scale are two Reference Statements representing the extremes of effort required for each ability, with the greatest effort placed at point 7 and the least effort placed at point 1. On the right hand side of the scale are three examples of Behavioral Anchors, placed at specific points on the scale to act as 'benchmarks' in your selection process. **Make your choice regarding the <u>greatest</u> physical exertion allowable for each medical situation using the Behavioral Anchors as guides.** Further, you will note that all three categories of each medical situation have been placed on the same page. **You must circle a specific number value on each of the three scales.**

The time required for the completion of this project will be less than one hour. Each of the six abilities have been color coded to aid in the process. All results of this study will be completely confidential. Please do not include your name on the returned packages. The results will be pooled to create a statistical estimation of the greatest allowable physical effort for each situation. Future studies will expand on these situations to provide a more inclusive evaluation. I will collect these packages in **one months time.** I will also be in contact with each of you prior to that time to assist you in any problems which may arise.

I recognize that this project is time consuming and I appreciate very much your agreeing to participate. The standards so developed may make tha decision regarding when to allow an individual to return to work, a little easier. Thank you once again for your time and effort.

MEDICAL STANDARDS ABILITY SCALE: STATIC STRENGTH

This is the ability to use muscle force to lift, push, pull, or carry objects. It is the maximum force that one can exert for a brief period of time.

MEDICAL PROBLEM: PREVIOUS LOW BACK PAIN

Performance Extremes	Category A	Category B	Category C	Behavioral Anchors
Requires use of all the muscle force possible to lift, carry, push or pull a very heavy object.	7	7	7	- Lift bags of cement into truck.
	6	6	6	
	5	5	5	
	4	4	4	- Pull a sack of mulch across a yard.
	3	3	3	
	2	2	2	
Requires use of a little muscle force to lift, carry, push or pull a light object.	1	1	1	- Lift a package of bond paper.

Category A: This person is completely asymptomatic, with no pain or limitation of any kind.

Category B: This person experiences pain and limitation with mildly strenuous activities.

Category C: This person experiences pain and limitation with activities of daily living.

MEDICAL STANDARDS ABILITY SCALE: TRUNK STRENGTH

This ability involves the degree to which one's stomach and lower back can support part of the body repeatedly or continuously over time. The degree to which these muscles do not "give out" or fatigue.

MEDICAL PROBLEM: PREVIOUS LOW BACK PAIN

Performance Extremes	Category A	Category B	Category C	Behavioral Anchors
Requires use of all the stomach and lower back muscles to hold up or move part of your body, for as long as possible.	7	7	7	- Do 100 sit-ups.
	6	6	6	
	5	5	5	
	4	4	4	- Lay carpet.
	3	3	3	
	2	2	2	
Requires use of a little stomach and lower back muscle force to hold up or move part of your body for a short time.	1	1	1	- Sit up in a reclining chair.

Category A: This person is completely asymptomatic, with no pain or limitation of any kind.

Category B: This person experiences pain and limitation with mildly strenuous activities.

Category C: This person experiences pain and limitation with activities of daily living.

MEDICAL STANDARDS ABILITY SCALE: STAMINA

This is the ability to exert oneself physically over a period of time without getting winded or out of breath.

MEDICAL PROBLEM: PREVIOUS LOW BACK PAIN

Performance Extremes	Category A	Category B	Category C	Behavioral Anchors
Requires physical activity of the whole body over a long time, with great strain on the heart and blood vessels.	7	7	7	- Dig ditches all day.
	6	6	6	
	5	5	5	
	4	4	4	- Mow a small yard.
	3	3	3	
	2	2	2	
Requires physical activity of the whole body over a short time, with little strain on the heart and blood vessels.	1	1	1	- Wash a chalkboard.

Category A: This person is completely asymptomatic, with no pain or limitation of any kind.

Category B: This person experiences pain and limitation with mildly strenuous activities.

Category C: This person experiences pain and limitation with activities of daily living.

MEDICAL STANDARDS ABILITY SCALE: EXTENT FLEXIBILITY

This is the ability to bend, stretch, twist, or reach out, with the body, arms, and/or legs.

MEDICAL PROBLEM: <u>PREVIOUS LOW BACK PAIN</u>

Performance Extremes	Category A	Category B	Category C	Behavioral Anchors
Requires a high degree of bending, stretching, twisting or reaching out into unusual positions.	7	7	7	- Work as a lineman on a utility pole.
	6	6	6	
	5	5	5	
	4	4	4	- Coil up hoses on a fire truck.
	3	3	3	
	2	2	2	
Requires a low degree of bending, stretching or reaching out.	1	1	1	- Reach for a telephone.

Category A: This person is completely asymptomatic, with no pain or limitation of any kind.

Category B: This person experiences pain and limitation with mildly strenuous activities.

Category C: This person experiences pain and limitation with activities of daily living.

MEDICAL STANDARDS ABILITY SCALE: DYNAMIC FLEXIBILITY

This is the ability to bend, stretch, twist, or reach out with the body, arms and/or legs both quickly and repeatedly.

MEDICAL PROBLEM: <u>PREVIOUS LOW BACK PAIN</u>

Performance Extremes	Category A	Category B	Category C	Behavioral Anchors
Requires many fast and repeated body bending, twisting or stretching movements.	7	7	7	- Do the butterfly stroke at the olympics.
	6	6	6	
	5	5	5	
	4	4	4	- Milk cows.
	3	3	3	
	2	2	2	
Requires few repeated bending, twisting or stretching movements, where speed is not important.	1	1	1	- Collect shells at seashore.

Category A: This person is completely asymptomatic, with no pain or limitation of any kind.

Category B: This person experiences pain and limitation with mildly strenuous activities.

Category C: This person experiences pain and limitation with activities of daily living.

MEDICAL STANDARDS ABILITY SCALE: MOBILITY

The capacity to move one's body from place to place. This capacity does not include accuracy, speed or precise coordination.

MEDICAL PROBLEM: <u>PREVIOUS LOW BACK PAIN</u>

Performance Extremes	Category A	Category B	Category C	Behavioral Anchors
Requires continuous transport of the body in the workplace.	7	7	7	- Chase a thief on foot.
	6	6	6	
	5	5	5	
	4	4	4	- Work on electrical wiring of a housing project.
	3	3	3	
	2	2	2	
Requires some body transport for brief periods in the workplace.	1	1	1	- Work as a telephone operator.

Category A: This person is completely asymptomatic, with no pain or limitation of any kind.

Category B: This person experiences pain and limitation with mildly strenuous activities.

Category C: This person experiences pain and limitation with activities of daily living.

MEDICAL STANDARDS ABILITY SCALE: STATIC STRENGTH

This is the ability to use muscle force to lift, push, pull, or carry objects. It is the maximum force that one can exert for a brief period of time.

MEDICAL PROBLEM: PREVIOUS SCIATICA

Performance Extremes	Category A	Category B	Category C	Behavioral Anchors
Requires use of all the muscle force possible to lift, carry, push or pull a very heavy object.	7	7	7	- Lift bags of cement into truck.
	6	6	6	
	5	5	5	
	4	4	4	- Pull a sack of mulch across a yard.
	3	3	3	
	2	2	2	
Requires use of a little muscle force to lift, carry, push or pull a light object.	1	1	1	- Lift a package of bond paper.

Category A: This person is completely asymptomatic, with no pain or limitation of any kind.

Category B: This person experiences pain and limitation with mildly strenuous activities.

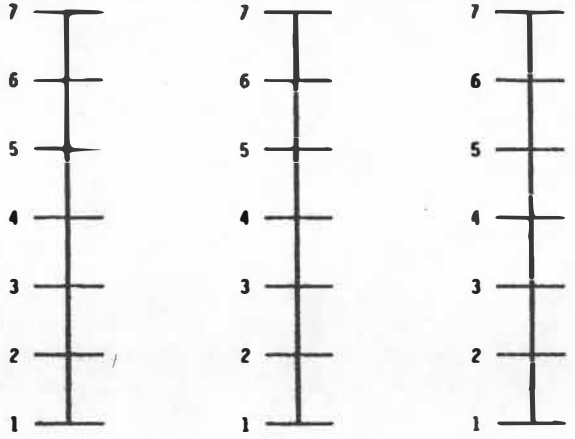
Category C: This person experiences pain and limitation with activities of daily living.

MEDICAL STANDARDS ABILITY SCALE: TRUNK STRENGTH

This ability involves the degree to which one's stomach and lower back can support part of the body repeatedly or continuously over time. The degree to which these muscles do not "give out" or fatigue.

MEDICAL PROBLEM: PREVIOUS SCIATICA

Performance Extremes	Category A	Category B	Category C	Behavioral Anchors
Requires use of all the stomach and lower back muscles to hold up or move part of your body, for as long as possible.	7	7	7	- Do 100 sit-ups.
	6	6	6	
	5	5	5	
	4	4	4	- Lay carpet.
	3	3	3	
	2	2	2	
Requires use of a little stomach and lower back muscle force to hold up or move part of your body for a short time.	1	1	1	- Sit up in a reclining chair.



Category A: This person is completely asymptomatic, with no pain or limitation of any kind.

Category B: This person experiences pain and limitation with mildly strenuous activities.

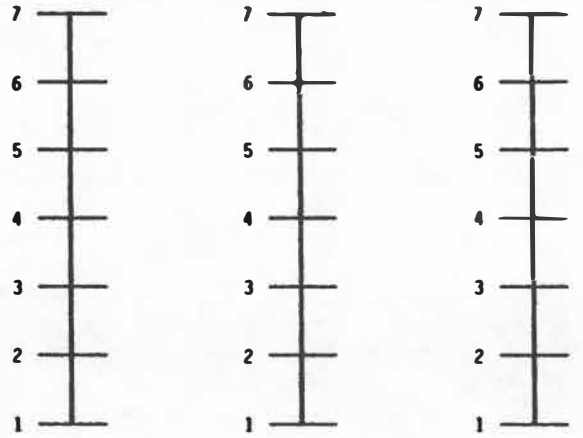
Category C: This person experiences pain and limitation with activities of daily living.

MEDICAL STANDARDS ABILITY SCALE: STAMINA

This is the ability to exert oneself physically over a period of time without getting winded or out of breath.

MEDICAL PROBLEM: PREVIOUS SCIATICA

Performance Extremes	Category A	Category B	Category C	Behavioral Anchors
Requires physical activity of the whole body over a long time, with great strain on the heart and blood vessels.	7	7	7	- Dig ditches all day.
	6	6	6	
	5	5	5	
	4	4	4	- Mow a small yard.
	3	3	3	
	2	2	2	
Requires physical activity of the whole body over a short time, with little strain on the heart and blood vessels.	1	1	1	- Wash a chalkboard.



Category A: This person is completely asymptomatic, with no pain or limitation of any kind.

Category B: This person experiences pain and limitation with mildly strenuous activities.

Category C: This person experiences pain and limitation with activities of daily living.

MEDICAL STANDARDS ABILITY SCALE: EXTENT FLEXIBILITY

This is the ability to bend, stretch, twist, or reach out, with the body, arms, and/or legs.

MEDICAL PROBLEM: <u>PREVIOUS SCIATICA</u>

Performance Extremes	Category A	Category B	Category C	Behavioral Anchors
Requires a high degree of bending, stretching, twisting or reaching out into unusual positions.	7	7	7	- Work as a lineman on a utility pole.
	6	6	6	
	5	5	5	
	4	4	4	- Coil up hoses on a fire truck.
	3	3	3	
	2	2	2	
Requires a low degree of bending, stretching or reaching out.	1	1	1	- Reach for a telephone.

Category A: This person is completely asymptomatic, with no pain or limitation of any kind.

Category B: This person experiences pain and limitation with mildly strenuous activities.

Category C: This person experiences pain and limitation with activities of daily living.

MEDICAL STANDARDS ABILITY SCALE: DYNAMIC FLEXIBILITY

This is the ability to bend, stretch, twist, or reach out with the body, arms and/or legs both quickly and repeatedly.

MEDICAL PROBLEM: PREVIOUS SCIATICA

Performance Extremes	Category A	Category B	Category C	Behavioral Anchors
Requires many fast and repeated body bending, twisting or stretching movements.	7	7	7	- Do the butterfly stroke at the olympics.
	6	6	6	
	5	5	5	
	4	4	4	- Milk cows.
	3	3	3	
	2	2	2	
Requires few repeated bending, twisting or stretching movements, where speed is not important.	1	1	1	- Collect shells at seashore.

Category A: This person is completely asymptomatic, with no pain or limitation of any kind.

Category B: This person experiences pain and limitation with mildly strenuous activities.

Category C: This person experiences pain and limitation with activities of daily living.

MEDICAL STANDARDS ABILITY SCALE: MOBILITY

The capacity to move one's body from place to place. This capacity does not include accuracy, speed or precise coordination.

MEDICAL PROBLEM: <u>PREVIOUS SCIATICA</u>

Performance Extremes	Category A	Category B	Category C	Behavioral Anchors
Requires continuous transport of the body in the workplace.	7	7	7	- Chase a thief on foot.
	6	6	6	
	5	5	5	
	4	4	4	- Work on electrical wiring of a housing project.
	3	3	3	
	2	2	2	
Requires some body transport for brief periods in the workplace.	1	1	1	- Work as a telephone operator.

Category A: This person is completely asymptomatic, with no pain or limitation of any kind.

Category B: This person experiences pain and limitation with mildly strenuous activities.

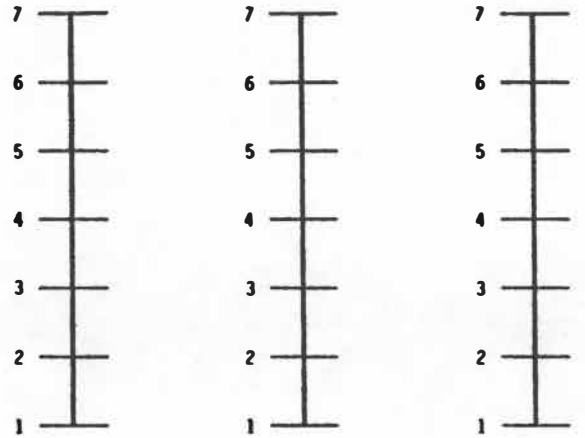
Category C: This person experiences pain and limitation with activities of daily living.

MEDICAL STANDARDS ABILITY SCALE: STATIC STRENGTH

This is the ability to use muscle force to lift, push, pull, or carry objects.
It is the maximum force that one can exert for a brief period of time.

MEDICAL PROBLEM: PREVIOUS SURGICAL PROCEDURE ON LOW BACK

Performance Extremes	Category A	Category B	Category C	Behavioral Anchors
Requires use of all the muscle force possible to lift, carry, push or pull a very heavy object.	7	7	7	- Lift bags of cement into truck.
	6	6	6	
	5	5	5	
	4	4	4	- Pull a sack of mulch across a yard.
	3	3	3	
	2	2	2	
Requires use of a little muscle force to lift, carry, push or pull a light object.	1	1	1	- Lift a package of bond paper.



Category A: This person is completely asymptomatic, with no pain or limitation of any kind.

Category B: This person experiences pain and limitation with mildly strenuous activities.

Category C: This person experiences pain and limitation with activities of daily living.

MEDICAL STANDARDS ABILITY SCALE: TRUNK STRENGTH

This ability involves the degree to which one's stomach and lower back can support part of the body repeatedly or continuously over time. The degree to which these muscles do not "give out" or fatigue.

MEDICAL PROBLEM: PREVIOUS SURGICAL PROCEDURE ON LOW BACK

Performance Extremes	Category A	Category B	Category C	Behavioral Anchors
Requires use of all the stomach and lower back muscles to hold up or move part of your body, for as long as possible.	7	7	7	- Do 100 sit-ups.
	6	6	6	
	5	5	5	
	4	4	4	- Lay carpet.
	3	3	3	
	2	2	2	
Requires use of a little stomach and lower back muscle force to hold up or move part of your body for a short time.	1	1	1	- Sit up in a reclining chair.

Category A: This person is completely asymptomatic, with no pain or limitation of any kind.

Category B: This person experiences pain and limitation with mildly strenuous activities.

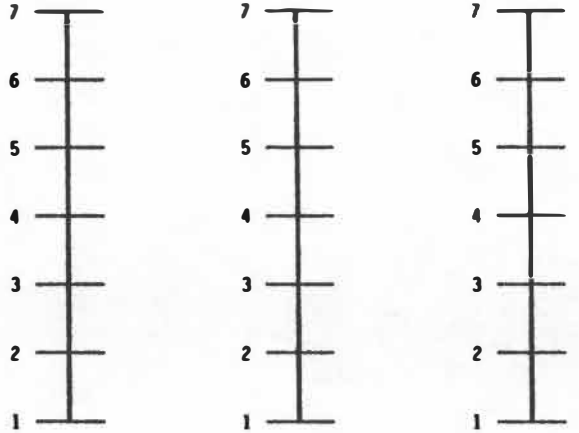
Category C: This person experiences pain and limitation with activities of daily living.

MEDICAL STANDARDS ABILITY SCALE: STAMINA

This is the ability to exert oneself physically over a period of time without getting winded or out of breath.

MEDICAL PROBLEM: **PREVIOUS SURGICAL PROCEDURE ON LOW BACK**

Performance Extremes	Category A	Category B	Category C	Behavioral Anchors
Requires physical activity of the whole body over a long time, with great strain on the heart and blood vessels.	7	7	7	- Dig ditches all day.
	6	6	6	
	5	5	5	
	4	4	4	- Mow a small yard.
	3	3	3	
	2	2	2	
Requires physical activity of the whole body over a short time, with little strain on the heart and blood vessels.	1	1	1	- Wash a chalkboard.



Category A: This person is completely asymptomatic, with no pain or limitation of any kind.

Category B: This person experiences pain and limitation with mildly strenuous activities.

Category C: This person experiences pain and limitation with activities of daily living.

MEDICAL STANDARDS ABILITY SCALE: EXTENT FLEXIBILITY

This is the ability to bend, stretch, twist, or reach out, with the body, arms, and/or legs.

MEDICAL PROBLEM: <u>PREVIOUS SURGICAL PROCEDURE ON LOW BACK</u>

Performance Extremes	Category A	Category B	Category C	Behavioral Anchors
Requires a high degree of bending, stretching, twisting or reaching out into unusual positions.	7	7	7	- Work as a lineman on a utility pole.
	6	6	6	
	5	5	5	
	4	4	4	- Coil up hoses on a fire truck.
	3	3	3	
	2	2	2	
Requires a low degree of bending, stretching or reaching out.	1	1	1	- Reach for a telephone.

Category A: This person is completely asymptomatic, with no pain or limitation of any kind.

Category B: This person experiences pain and limitation with mildly strenuous activities.

Category C: This person experiences pain and limitation with activities of daily living.

MEDICAL STANDARDS ABILITY SCALE: DYNAMIC FLEXIBILITY

This is the ability to bend, stretch, twist, or reach out with the body, arms and/or legs both quickly and repeatedly.

MEDICAL PROBLEM: **PREVIOUS SURGICAL PROCEDURE ON LOW BACK**

Performance Extremes	Category A	Category B	Category C	Behavioral Anchors
Requires many fast and repeated body bending, twisting or stretching movements.	7	7	7	- Do the butterfly stroke at the olympics.
	6	6	6	
	5	5	5	
	4	4	4	- Milk cows.
	3	3	3	
	2	2	2	
Requires few repeated bending, twisting or stretching movements, where speed is not important.	1	1	1	- Collect shells at seashore.

Category A: This person is completely asymptomatic, with no pain or limitation of any kind.

Category B: This person experiences pain and limitation with mildly strenuous activities.

Category C: This person experiences pain and limitation with activities of daily living.

MEDICAL STANDARDS ABILITY SCALE: MOBILITY

The capacity to move one's body from place to place. This capacity does not include accuracy, speed or precise coordination.

MEDICAL PROBLEM: **PREVIOUS SURGICAL PROCEDURE ON LOW BACK**

Performance Extremes	Category A	Category B	Category C	Behavioral Anchors
Requires continuous transport of the body in the workplace.	7	7	7	- Chase a thief on foot.
	6	6	6	
	5	5	5	
	4	4	4	- Work on electrical wiring of a housing project.
	3	3	3	
	2	2	2	
Requires some body transport for brief periods in the workplace.	1	1	1	- Work as a telephone operator.

Category A: This person is completely asymptomatic, with no pain or limitation of any kind.

Category B: This person experiences pain and limitation with mildly strenuous activities.

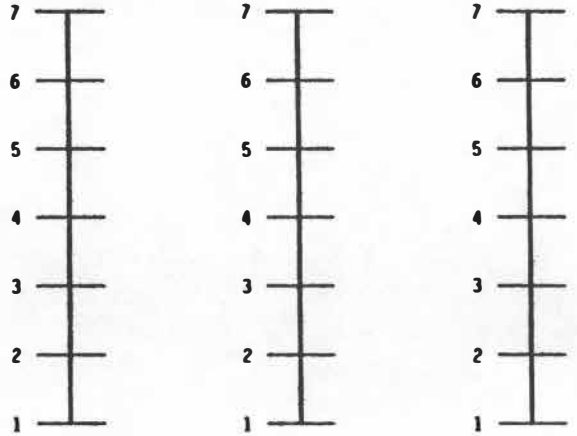
Category C: This person experiences pain and limitation with activities of daily living.

MEDICAL STANDARDS ABILITY SCALE: STATIC STRENGTH

This is the ability to use muscle force to lift, push, pull, or carry objects. It is the maximum force that one can exert for a brief period of time.

MEDICAL PROBLEM: SCOLIOSIS: GREATER THAN 30 DEGREES LUMBAR, GREATER THAN 50 DEGREES THORACIC

Performance Extremes	Category A	Category B	Category C	Behavioral Anchors
Requires use of all the muscle force possible to lift, carry, push or pull a very heavy object.	7	7	7	- Lift bags of cement into truck.
	6	6	6	
	5	5	5	
	4	4	4	- Pull a sack of mulch across a yard.
	3	3	3	
	2	2	2	
Requires use of a little muscle force to lift, carry, push or pull a light object.	1	1	1	- Lift a package of bond paper.



Category A: This person is completely asymptomatic, with no pain or limitation of any kind.

Category B: This person experiences pain and limitation with mildly strenuous activities.

Category C: This person experiences pain and limitation with activities of daily living.

MEDICAL STANDARDS ABILITY SCALE: TRUNK STRENGTH

This ability involves the degree to which one's stomach and lower back can support part of the body repeatedly or continuously over time. The degree to which these muscles do not "give out" or fatigue.

MEDICAL PROBLEM: <u>SCOLIOSIS: GREATER THAN 30 DEGREES LUMBAR, GREATER THAN 50 DEGREES THORACIC</u>

Performance Extremes	Category A	Category B	Category C	Behavioral Anchors
Requires use of all the stomach and lower back muscles to hold up or move part of your body, for as long as possible.	7	7	7	- Do 100 sit-ups.
	6	6	6	
	5	5	5	
	4	4	4	- Lay carpet.
	3	3	3	
	2	2	2	
Requires use of a little stomach and lower back muscle force to hold up or move part of your body for a short time.	1	1	1	- Sit up in a reclining chair.

Category A: This person is completely asymptomatic, with no pain or limitation of any kind.

Category B: This person experiences pain and limitation with mildly strenuous activities.

Category C: This person experiences pain and limitation with activities of daily living.

MEDICAL STANDARDS ABILITY SCALE: STAMINA

This is the ability to exert oneself physically over a period of time without getting winded or out of breath.

MEDICAL PROBLEM: SCOLIOSIS: GREATER THAN 30 DEGREES LUMBAR, GREATER THAN 50 DEGREES THORACIC

Performance Extremes	Category A	Category B	Category C	Behavioral Anchors
Requires physical activity of the whole body over a long time, with great strain on the heart and blood vessels.	7	7	7	- Dig ditches all day.
	6	6	6	
	5	5	5	
	4	4	4	- Mow a small yard.
	3	3	3	
	2	2	2	
Requires physical activity of the whole body over a short time, with little strain on the heart and blood vessels.	1	1	1	- Wash a chalkboard.

Category A: This person is completely asymptomatic, with no pain or limitation of any kind.

Category B: This person experiences pain and limitation with mildly strenuous activities.

Category C: This person experiences pain and limitation with activities of daily living.

MEDICAL STANDARDS ABILITY SCALE: EXTENT FLEXIBILITY

This is the ability to bend, stretch, twist, or reach out, with the body, arms, and/or legs.

MEDICAL PROBLEM: <u>SCOLIOSIS: GREATER THAN 30 DEGREES LUMBAR, GREATER THAN 50 DEGREES THORACIC</u>

Performance Extremes	Category A	Category B	Category C	Behavioral Anchors
Requires a high degree of bending, stretching, twisting or reaching out into unusual positions.	7	7	7	- Work as a lineman on a utility pole.
	6	6	6	
	5	5	5	
	4	4	4	- Coil up hoses on a fire truck.
	3	3	3	
	2	2	2	
Requires a low degree of bending, stretching or reaching out.	1	1	1	- Reach for a telephone.

Category A: This person is completely asymptomatic, with no pain or limitation of any kind.

Category B: This person experiences pain and limitation with mildly strenuous activities.

Category C: This person experiences pain and limitation with activities of daily living.

MEDICAL STANDARDS ABILITY SCALE: DYNAMIC FLEXIBILITY

This is the ability to bend, stretch, twist, or reach out with the body, arms and/or legs both quickly and repeatedly.

MEDICAL PROBLEM: SCOLIOSIS: GREATER THAN 30 DEGREES LUMBAR, GREATER THAN 50 DEGREES THORACIC

Performance Extremes	Category A	Category B	Category C	Behavioral Anchors
Requires many fast and repeated body bending, twisting or stretching movements.	7	7	7	- Do the butterfly stroke at the olympics.
	6	6	6	
	5	5	5	
	4	4	4	- Milk cows.
	3	3	3	
	2	2	2	
Requires few repeated bending, twisting or stretching movements, where speed is not important.	1	1	1	- Collect shells at seashore.

Category A: This person is completely asymptomatic, with no pain or limitation of any kind.

Category B: This person experiences pain and limitation with mildly strenuous activities.

Category C: This person experiences pain and limitation with activities of daily living.

MEDICAL STANDARDS ABILITY SCALE: MOBILITY

The capacity to move one's body from place to place. This capacity does not include accuracy, speed or precise coordination.

MEDICAL PROBLEM: <u>SCOLIOSIS: GREATER THAN 30 DEGREES LUMBAR, GREATER THAN 50 DEGREES THORACIC</u>

Performance Extremes	Category A	Category B	Category C	Behavioral Anchors
Requires continuous transport of the body in the workplace.	7	7	7	- Chase a thief on foot.
	6	6	6	
	5	5	5	
	4	4	4	- Work on electrical wiring of a housing project.
	3	3	3	
	2	2	2	
Requires some body transport for brief periods in the workplace.	1	1	1	- Work as a telephone operator.

Category A: This person is completely asymptomatic, with no pain or limitation of any kind.

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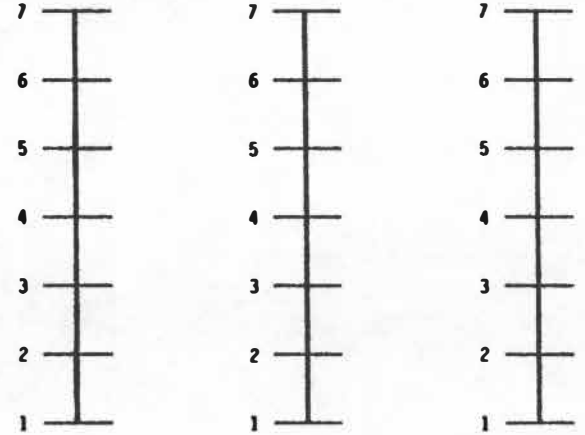
Category C: This person experiences pain and limitation with activities of daily living.

MEDICAL STANDARDS ABILITY SCALE: STATIC STRENGTH

This is the ability to use muscle force to lift, push, pull, or carry objects.
It is the maximum force that one can exert for a brief period of time.

MEDICAL PROBLEM: <u>SPONDYLOLISTHESIS WITHOUT SURGERY</u>

Performance Extremes	Category A	Category B	Category C	Behavioral Anchors
Requires use of all the muscle force possible to lift, carry, push or pull a very heavy object.	7	7	7	- Lift bags of cement into truck.
	6	6	6	
	5	5	5	
	4	4	4	- Pull a sack of mulch across a yard.
	3	3	3	
	2	2	2	
Requires use of a little muscle force to lift, carry, push or pull a light object.	1	1	1	- Lift a package of bond paper.



Category A: This person is completely asymptomatic, with no pain or limitation of any kind.

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Category C: This person experiences pain and limitation with activities of daily living.

MEDICAL STANDARDS ABILITY SCALE: TRUNK STRENGTH

This ability involves the degree to which one's stomach and lower back can support part of the body repeatedly or continuously over time. The degree to which these muscles do not "give out" or fatigue.

MEDICAL PROBLEM: SPONDYLOLISTHESIS WITHOUT SURGERY

Performance Extremes	Category A	Category B	Category C	Behavioral Anchors
Requires use of all the stomach and lower back muscles to hold up or move part of your body, for as long as possible.	7	7	7	- Do 100 sit-ups.
	6	6	6	
	5	5	5	
	4	4	4	- Lay carpet.
	3	3	3	
	2	2	2	
Requires use of a little stomach and lower back muscle force to hold up or move part of your body for a short time.	1	1	1	- Sit up in a reclining chair.

Category A: This person is completely asymptomatic, with no pain or limitation of any kind.

Category B: This person experiences pain and limitation with mildly strenuous activities.

Category C: This person experiences pain and limitation with activities of daily living.

MEDICAL STANDARDS ABILITY SCALE: STAMINA

This is the ability to exert oneself physically over a period of time without getting winded or out of breath.

MEDICAL PROBLEM: SPONDYLOLISTHESIS WITHOUT SURGERY

Performance Extremes	Category A	Category B	Category C	Behavioral Anchors
Requires physical activity of the whole body over a long time, with great strain on the heart and blood vessels.	7	7	7	- Dig ditches all day.
	6	6	6	
	5	5	5	
	4	4	4	- Mow a small yard.
	3	3	3	
	2	2	2	
Requires physical activity of the whole body over a short time, with little strain on the heart and blood vessels.	1	1	1	- Wash a chalkboard.

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Category C: This person experiences pain and limitation with activities of daily living.

MEDICAL STANDARDS ABILITY SCALE: EXTENT FLEXIBILITY

This is the ability to bend, stretch, twist, or reach out, with the body, arms, and/or legs.

MEDICAL PROBLEM: SPONDYLOLISTHESIS WITHOUT SURGERY

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Requires a high degree of bending, stretching, twisting or reaching out into unusual positions.	7	7	7	- Work as a lineman on a utility pole.
	6	6	6	
	5	5	5	
	4	4	4	- Coil up hoses on a fire truck.
	3	3	3	
	2	2	2	
Requires a low degree of bending, stretching or reaching out.	1	1	1	- Reach for a telephone.

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MEDICAL STANDARDS ABILITY SCALE: DYNAMIC FLEXIBILITY

This is the ability to bend, stretch, twist, or reach out with the body, arms and/or legs both quickly and repeatedly.

MEDICAL PROBLEM: <u>SPONDYLOLISTHESIS WITHOUT SURGERY</u>

Performance Extremes	Category A	Category B	Category C	Behavioral Anchors
Requires many fast and repeated body bending, twisting or stretching movements.	7	7	7	- Do the butterfly stroke at the olympics.
	6	6	6	
	5	5	5	
	4	4	4	- Milk cows.
	3	3	3	
	2	2	2	
Requires few repeated bending, twisting or stretching movements, where speed is not important.	1	1	1	- Collect shells at seashore.

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MEDICAL STANDARDS ABILITY SCALE: MOBILITY

The capacity to move one's body from place to place. This capacity does not include accuracy, speed or precise coordination.

MEDICAL PROBLEM: SPONDYLOLISTHESIS WITHOUT SURGERY

Performance Extremes	Category A	Category B	Category C	Behavioral Anchors
Requires continuous transport of the body in the workplace.	7	7	7	- Chase a thief on foot.
	6	6	6	
	5	5	5	
	4	4	4	- Work on electrical wiring of a housing project.
	3	3	3	
	2	2	2	
Requires some body transport for brief periods in the workplace.	1	1	1	- Work as a telephone operator.

Category A: This person is completely asymptomatic, with no pain or limitation of any kind.

Category B: This person experiences pain and limitation with mildly strenuous activities.

Category C: This person experiences pain and limitation with activities of daily living.

APPENDIX F

NURSE-SPECIFIC BEHAVIORAL ANCHORS SELECTION AND PILOT TEST DATA

NURSE-SPECIFIC BEHAVIORAL ANCHORS
SELECTION LIST

Ability - Static Strength

Initial listing scale reading 7
- Lift linen bag
- Lift 200 lb. patient up in bed
- Lift patient out of bed
- Lift patient from bed to chair
- Pushing clinitron bed
- Lift unresponsive patient into bed from stretcher
- Move patient with flaccid muscles from bed to chair

Final selection
- Lift unresponsive patient into bed from stretcher

Initial listing scale reading 4
- Pull code cart down hall
- Push patient in bed
- Move patient to edge of bed
- Turn patient from side to side
- Assist patient from chair to stand
- Pushing patient in wheelchair
- Pull patient up in bed
- Transfer patient from bed to stretcher
- Lift IV pump

Final selection
- Pull patient up in bed

Initial listing scale reading 1
- Lift charts
- Lift IV pole to other side of bed
- Lift patient with help
- Lift food tray
- Lift dirty linen
- Assist patient out of bed to chair
- Placing patient's feet on foot rest of wheelchair

Final selection
- Place patient's feet on foot rest of wheelchair

Ability - Trunk Strength

Initial listing scale reading 7
    Leaning over patient to do bed bath
    Getting patient out of bed to chair
    Total bed bath
    Getting up and down repeatedly
    CPR
    Bed bath to totally dependent patient
    Bending over patient doing treatment
    Turning large patient
Final selection
    Bed bath to totally dependent patient

Initial listing scale reading 4
    Rubbing patient with lotion
    Turn immobile patient with sheet
    Making an occupied bed
    Direct treatments - bath, dressing
    Making beds
Final selection
    Making occupied bed

Initial listing scale reading 1
    Standing at bedside
    Sitting at desk charting
    Pouring out water
    Set up for bath
    Pivot patient into chair
    Assist patient giving self bath;
Final selection
    Sit at desk and do charting

Ability - Stamina

Initial listing scale reading 7
- Chest compressions
- Basic nursing care
- CPR
- Assist with care of 5 - 10 patients all shift
- One-man CPR
- Holding uncooperative patient for L.P.

Final selection
- One-man CPR

Initial listing scale reading 4
- Ventilating patient with bag
- Assisting with CPR
- Giving medications and treatment for 8 hours
- Bed bath of confused patient
- Chest compressions
- Making beds
- Pushing wheelchair
- Operate machinery in OHU

Final selection
- Ventilate patient with Ambu bag

Initial listing scale reading 1
- Taking VSs
- Recording nursing notes
- Placing cardiac board
- Pushing stretcher
- Preparing medications
- Cleaning patient

Final selection
- Taking vital signs

Ability Extent Flexibility

Initial listing scale reading 7
- Hang IV tubing
- General ER nursing duties
- Starting IV on confused patient
- Direct patient care
- Starting IV on combative patient
- Hang IV on high pole
- Restrain patient
- CPR

Final selection
- Restrain patient

Initial listing scale reading 4
- Gather equipment to start IV
- Untangle IV lines
- Start IV in midst of other lines
- Suctioning tracheostomy
- Making beds
- Reaching for supplies on shelf
- Assisting with care

Final selection
- Untangle multiple IV lines

Initial listing scale reading 1
- Reaching for supplies to start IV
- Speaking with patient on intercom
- Reach for telephone
- Starting an IV
- Assist other person starting IV
- Answer phone

Final selection
- Reach for telephone

Ability - Dynamic Flexibility

Initial listing scale reading 7
    ROM exercises with patient's legs
    CPR
    ROM to all extremities
    Hang IVs
    ROM totally dependent patient
    ROM quadriplegic patient
Final selection
    ROM exercises on totally dependent patient

Initial listing scale reading 4
    ROM patient's arms
    Use computer
    Lift patient's chart
    Back rub
    Ambu patient
    Assist other in ROM for patient
Final selection
    Give patient back rub

Initial listing scale reading 1
    ROM with patient's fingers
    Helping patient walk
    Turning patient in bed
    Put chart together
    Pick up trash
    Feed patient
    Observe other RN doing ROM exercises
Final selection
    Picking up trash

Ability - Mobility

Initial listing scale reading 7
- Answering patients call light
- Responding to code 99
- Chasing a patient on foot
- Walk constantly between rooms
- Passing out medications to 30 patient
- Making nursing rounds
- CPR

Final selection
- Responding to code 99

Initial listing scale reading 4
- Walking from room to room
- Continuous charting of patient's IV chemotherapy
- Rounding on patients
- Bed and bath for immobile patient
- Pushing medication cart
- Making rounds on patients with MD
- Nursing rounds

Final selection
- Making rounds with physician

Initial listing scale reading 1
- Walking from nursing station to room
- Desk nurse
- Answering patient's call light
- Secretarial skills
- Charge nurse
- Charting at desk
- Sitting down to chart

Final selection
- Charting at desk

TABLE F - 1

BEHAVIORAL ANCHORS COMPARISON
PILOT TEST DATA

Ability	Original Anchors	Nurse Anchors
1. Static Strength	7,7,7,5,7,7,4	7,6,5,4,4,3
2. Trunk Strength	5,6,6,4,4,1,3	4,4,6,6,7,2
3. Stamina	6,5,6,7,7,4,7	4,4,5,6,4,7
4. Extent Flexibility	3,2,3,2,2,1,1	1,2,2,4,3,3
5. Dynamic Flexibility	3,4,5,6,3,4,3	5,5,4,3,3,2
6. Mobility	3,3,5,2,2,2,1	5,4,4,3,3,2

TABLE F - 2

BEHAVIORAL ANCHORS COMPARISON STATISTICS

Ability	Original Anchors X	Original Anchors SD	Nurse Anchors X	Nurse Anchors SD	t	p
1. Static Strength	6.3	1.3	4.8	1.5	1.9	0.1
2. Trunk Strength	4.1	1.8	4.8	1.8	-0.7	0.5
3. Stamina	6.0	1.2	5.0	1.3	1.5	0.2
4. Extent Flexibility	2.0	0.8	2.5	1.1	-1.0	0.4
5. Dynamic Flexibility	4.0	1.2	3.7	1.2	0.5	0.6
6. Mobility	2.6	1.3	3.5	1.1	-1.4	0.2

APPENDIX G

NURSING ABILITY SCALES DATA

TABLE G

NURSING ABILITY SCALES DATA

#	Ability 1	2	3	4	5	6	Age	Sex	Ht	Wt	PLBP	PEH	LA	OJI
1	5	4	7	3	5	4	22	F	63	140	L	H	M	
2	7	3	6	2	4	3	43	M	72	250		M	L	
3	7	5	3	2	2	1	30	F	69	135	P	H	M	X
4	7	6	6	2	5	2	34	F	63	125		M	M	
5	7	5	5	4	5	7	43	F	65	190	P	H	M	
6	5	2	7	2	2	2	42	F	68	170	P	H	M	
7	6	3	6	2	5	2	35	F	66	145	L	M	M	X
8	6	3	6	2	5	2	42	F	64	180		M	M	
9	5	3	6	2	3	3	42	F	65	160		M	M	
10	6	5	5	2	5	2	52	F	64	170	LS	L	L	
11	5	4	5	7	4	5	52	F	62	98	P	H	H	
12	6	5	6	2	5	3	35	F	60	116	P	H	H	
13	5	3	4	3	3	3	48	F	65	185	P	H	M	
14	7	4	4	1	1	1	60	F	61	150	LS	M	M	X
15*	7	5	5	2	3	4	43	F	62	115	L	H	M	X
16	7	5	6	3	3	3	45	F	65	130		M	M	
17	7	6	5	2	4	3	31	F	60	114		H	H	
18	7	6	6	3	5	5	34	F	64	125	P	H	M	
19	5	4	7	2	4	2	32	F	66	130		M	H	
20	5	4	7	2	3	2	57	F	69	163		H	M	
21	7	1	4	1	4	2	33	F	66	130		M	M	
22	4	3	7	1	3	1	36	F	63	127		M	L	
23	5	5	5	6	6	6	34	M	72	190		M	L	
24	5	3	5	4	4	3	33	F	64	135	P	M	M	
25	5	1	5	1	3	2	42	F	68	150		M	M	
26	7	5	4	2	4	4	28	F	63	110		M	M	
27	7	5	7	4	5	5	34	F	66	140	P	M	M	
28*	6	3	5	2	4	4	33	F	68	150	L	M	M	
29*	7	3	5	2	5	4	46	F	65	140		M	M	
30	7	2	5	2	3	5	34	M	70	190	L	H	H	
31	6	3	5	3	4	5	24	F	65	125		M	M	
32	7	4	7	1	2	6	31	M	70	150		M	M	
33*	6	2	5	3	4	5	29	F	62	138		M	M	
34	7	6	7	5	6	5	40	F	70	169	P	H	M	
35	5	2	7	2	2	2	37	F	67	125	L	L	M	X
36	5	3	6	2	4	5	26	F	68	130		H	H	
37*	7	2	5	1	2	2	38	F	65	135		M	M	
38*	5	3	5	2	3	2	35	M	70	210	P	M	M	
39	5	4	7	4	5	3	46	F	67	153	P	H	M	
40	7	3	7	3	4	4	31	F	64	122		M	M	

TABLE G (Continued)

#	Ability 1	2	3	4	5	6	Age	Sex	Ht	Wt	PLBP	PEH	LA	OJI
41	6	5	6	4	5	3	53	F	65	130		H	M	
42	7	3	6	5	5	3	38	F	66	150		M	M	
43	6	5	7	3	5	6	33	F	65	200		M	M	
44	7	5	7	3	6	6	35	F	67	143		H	M	
45	6	5	6	2	4	4	26	F	66	161		M	M	
46	6	2	5	2	4	2	60	F	66	145		M	M	
47	5	3	4	2	4	4	30	F	63	120		H	L	
48	7	3	7	1	2	4	29	F	61	104	P	M	M	
49	7	3	4	1	1	5	34	F	64	185	P	H	M	
50	5	4	7	2	2	5	27	F	62	120		M	M	
51	7	4	6	3	2	2	25	F	61	100		M	H	
52	6	4	7	2	4	6	46	F	63	136	P	H	H	
53	7	4	5	3	5	6	29	M	72	180		H	H	
54	7	4	7	3	5	6	39	F	66	160		M	M	
55*	5	3	4	2	2	4	37	F	61	150	P	M	M	
56	5	4	4	2	4	2	33	F	67	125	P	M	M	
57	6	3	5	2	2	2	35	F	63	146	P	M	L	
58	7	4	7	4	5	6	24	F	63	138		M	M	
59	6	5	6	2	5	5	26	F	63	150	P	H	M	X
60	7	3	6	2	3	5	22	F	60	115		M	M	
61	6	3	3	2	2	4	27	F	67	125		L	M	
62	6	4	5	2	2	4	32	F	64	150	P	H	H	X
63	7	5	7	4	4	2	38	F	58	107	P	M	M	
64	6	5	5	2	5	3	29	F	64	150		M	M	
65	7	4	7	5	3	2	47	F	64	150	L	M	M	
66	5	4	4	2	4	5	31	F	62	175	P	M	M	
67	7	5	7	2	3	3	31	F	60	140	L	H	M	X
68	3	2	7	2	4	1	26	F	65	125		M	M	
69	5	3	6	2	6	5	28	F	66	180		M	M	
70	5	4	7	1	3	3	34	F	68	145	P	M	M	
71	6	2	5	1	2	2	43	F	64	185		M	M	
72	5	4	7	3	5	3	26	F	65	120	P	H	H	
73	5	4	7	2	3	5	26	F	63	105	P	M	M	
74	4	4	4	5	6	5	34	F	64	112		M	L	
75*	7	5	7	4	6	7	41	F	65	125	L	H	M	
76	7	5	7	3	5	6	32	F	65	185	L	M	L	
77	4	1	7	1	5	6	34	F	69	140	S	M	M	X
78*	6	4	5	3	6	5	40	F	66	155	L	L	L	
79	4	4	7	2	3	5	38	F	66	190	L	H	M	X
80	5	1	7	4	7	7	24	F	66	140		H	M	
81	6	5	6	7	5	5	42	F	65	180	L	H	M	X

TABLE G (Continued)

#	Ability 1	2	3	4	5	6	Age	Sex	Ht	Wt	PLBP	PEH	LA	OJI
82	6	7	6	7	5	7	29	F	69	150		M	M	
83	6	5	6	7	5	7	42	F	64	135		H	H	
84	3	3	4	5	5	5	57	F	66	150	S	M	M	X
85	6	3	4	2	4	3	31	F	63	127	P	M	H	
86	6	3	6	3	5	3	50	F	66	190	P	M	L	
87	4	3	6	2	4	3	25	F	62	126		M	H	
88	5	3	5	2	3	2	45	F	68	170	P	H	M	X
89	6	3	6	3	2	3	35	F	63	170		M	M	
90	7	3	4	1	3	1	57	F	65	176		M	L	
91	7	4	6	3	3	5	37	M	69	165		M	M	
92	7	5	5	3	5	6	37	F	64	115	P	M	H	X
93	7	4	6	3	5	3	30	F	70	130		H	H	
94	5	3	6	5	5	3	38	F	62	135	L	M	M	
95	5	3	6	4	4	5	41	F	63	155	L	H	M	X
96	5	3	5	4	4	5	33	F	63	145	L	H	M	
97	7	5	5	4	2	4	40	M	71	200	P	M	M	X
98	6	3	3	2	3	5	30	M	73	190	P	M	M	
99*	6	3	7	1	4	4	55	F	60	145		H	M	
100	4	3	5	2	4	2	24	F	69	130		M	M	
101	7	5	7	1	2	4	42	F	60	180		H	H	
102	4	3	4	2	2	2	35	F	62	116	L	M	M	X
103	5	3	4	3	4	1	28	F	66	130		M	M	
104	6	3	7	3	4	2	33	F	64	142		M	M	
105	5	5	3	2	2	2	40	M	67	160		M	M	
106*	6	3	7	4	5	4	35	M	70	177	P	M	M	
107	6	5	6	2	5	2	25	F	65	120		M	M	
108	5	2	4	1	1	1	32	F	64	183	L	M	M	X
109	4	2	6	2	1	3	43	F	63	200		H	L	
110	5	4	4	2	6	4	26	F	64	121	L	M	H	
111	6	3	6	2	2	3	31	F	63	152	L	M	M	X
112	7	3	6	1	2	2	48	F	61	128	P	M	L	
113	6	3	5	2	4	3	36	F	63	125		H	H	
114	5	5	4	3	4	3	32	F	68	150	L	M	M	X
115	7	3	7	4	5	4	35	F	66	150		M	M	X
116	6	2	6	3	2	1	33	F	60	130		H	M	
117*	6	3	7	4	4	2	35	F	60	195		H	L	
118	6	4	7	2	2	3	27	F	70	128	P	M	M	
119	7	1	7	4	4	1	28	F	64	220	P	H	M	
120	5	1	4	1	2	2	41	F	65	127		M	M	
121	7	5	7	5	6	7	28	F	61	115	P	H	M	
122	7	5	5	1	3	3	46	F	62	156	L	M	M	X

TABLE G (Continued)

#	Ability 1	2	3	4	5	6	Age	Sex	Ht	Wt	PLBP	PEH	LA	OJI
123	7	4	7	4	5	3	60	F	64	128	P	H	H	
124	6	3	6	1	6	3	52	F	62	120	P	M	M	
125	7	4	5	2	3	4	34	F	61	101		M	M	
126	6	4	5	2	4	3	35	F	63	132	L	H	H	X
127	7	3	7	3	6	7	25	F	65	135	L	M	H	X
128	7	5	4	5	3	3	36	F	66	250	L	H	M	X
129	4	5	4	2	3	5	24	F	69	160		M	M	
130	5	2	3	2	4	2	25	M	69	220		M	M	
131	4	3	7	1	2	1	47	F	64	138		M	M	
132	4	2	7	1	2	2	39	F	67	175		M	L	
133	6	5	7	4	4	6	35	F	61	185		H	M	
134*	4	3	5	2	3	2	47	F	68	114		L	M	
135	6	4	5	2	4	3	53	F	67	125		H	H	
136	6	5	5	2	6	3	50	F	60	130		H	H	
137	6	4	5	1	2	1	40	F	67	135	L	M	M	X
138	5	4	7	4	5	4	27	F	64	130	P	M	M	
139	7	4	6	3	6	2	27	F	65	130	P	L	L	
140	7	4	7	2	4	4	37	F	66	140		H	L	
141	6	4	7	2	5	5	35	F	66	123		H	M	
142	5	3	6	2	3	7	23	F	62	145		L	L	
143*	5	3	5	2	4	2	27	M	70	195		H	L	
144	5	3	5	3	2	2	29	F	67	137		H	H	
145	5	4	5	3	5	6	26	F	68	145	P	M	H	X
146	7	4	7	4	5	4	36	F	62	120	P	M	M	
147	5	3	7	6	4	7	26	F	66	180	P	M	M	
148	7	3	6	2	5	2	45	F	61	120		H	M	
149	4	3	5	3	1	3	33	F	66	167	P	H	L	
150	7	3	5	1	2	2	60	F	62	160	L	M	M	X
151	7	3	7	2	3	2	33	F	64	120		H	H	
152	6	4	5	2	4	3	27	F	70	250	P	M	L	
153	5	5	5	5	5	5	27	F	69	189		M	M	
154	7	4	5	2	5	3	34	F	64	173		M	L	
155	7	2	7	2	4	1	39	F	67	232	P	H	M	X
156	6	3	5	2	4	2	28	F	67	201		M	M	
157	5	3	5	3	3	3	35	F	60	95		M	M	
158	4	3	7	2	4	4	45	F	63	129		M	M	
159*	5	3	5	4	4	2	57	F	64	170		M	M	
160	6	2	7	4	5	4	37	F	63	200		M	L	
161	7	2	7	4	3	2	31	F	62	103		M	M	
162*	6	3	5	2	4	2	52	F	64	119		H	L	
163	4	3	4	5	4	5	39	F	65	114		H	M	

TABLE G (Continued)

#	Ability 1	2	3	4	5	6	Age	Sex	Ht	Wt	PLBP	PEH	LA	OJI
164	6	5	6	4	4	5	52	F	64	150	L	H	H	X
165	5	5	4	5	5	4	58	F	62	131		H	M	
166	4	2	7	1	3	2	56	F	62	145		H	M	
167	7	2	5	1	3	2	45	F	66	125		M	M	
168*	7	4	6	2	4	3	44	F	64	125		M	L	
169	4	4	4	3	4	4	32	F	62	121		M	H	
170	6	4	4	6	5	7	36	F	63	118	P	M	M	
171	3	3	7	2	3	6	35	F	68	135		M	M	
172	6	5	6	4	6	5	35	F	60	106		H	M	
173	5	2	4	1	2	2	49	M	67	180		H	M	
174	6	7	3	2	5	3	60	F	64	187	P	M	M	X
175	6	2	4	1	3	1	42	M	73	205	S	H	M	
176	7	2	3	2	2	2	28	F	64	132	L	H	M	X
177	6	3	6	1	1	1	35	F	63	120	P	M	M	X
178*	7	2	7	1	7	3	46	F	67	155		H	M	
179	4	2	5	2	3	1	45	F	66	160		M	L	
180	5	3	6	1	3	2	40	F	64	140		M	M	
181*	6	4	5	3	5	4	42	F	64	145		M	H	
182	4	1	2	1	1	2	35	F	68	134	L	M	M	X
183	6	4	5	2	3	2	33	F	65	200		M	M	
184*	5	5	5	2	2	6	28	F	62	115		M	L	
185	5	3	5	2	3	3	29	F	60	187		M	L	
186	5	4	6	3	4	4	41	F	62	144		M	M	
187	5	4	4	2	4	2	43	F	64	145	L	M	M	X
188	3	3	5	1	1	2	29	F	68	125	LS	M	M	X
189	2	2	2	3	2	3	30	F	62	110	L	M	M	X
190	4	3	1	3	1	4	31	F	64	106	P	L	M	
191	2	3	3	3	5	6	30	F	63	115		H	M	
192	4	2	2	2	1	4	34	F	65	160	P	M	M	
193	5	3	6	2	4	2	41	F	63	138		H	M	
194	5	3	6	1	5	5	26	F	68	140		M	L	
195*	5	4	6	2	2	3	29	F	68	173		M	L	
196	6	4	5	3	3	3	29	F	67	165	P	M	M	
197*	5	4	2	5	4	4	30	F	64	168	P	M	L	
198	6	4	5	5	4	2	34	F	63	110	P	M	H	
199	6	4	6	2	5	3	54	F	67	150		M	M	
200	6	5	6	4	6	7	21	F	66	120		L	H	
201	6	2	4	2	4	2	33	F	64	140		M	M	
202	5	3	5	1	3	2	25	F	68	126		H	M	
203	6	3	3	1	3	2	38	F	66	158		M	M	
204	5	5	7	2	3	1	31	F	65	125		M	M	

TABLE G (Continued)

#	Ability 1	2	3	4	5	6	Age	Sex	Ht	Wt	PLBP	PEH	LA	OJI
205	6	3	6	2	3	3	34	F	64	130	L	M	H	X
206	6	5	6	3	5	5	55	F	60	110	P	M	H	X
207	5	4	5	4	4	4	36	F	66	130		M	M	
208	6	3	7	3	4	3	34	F	68	182		H	M	
209	7	4	4	2	4	5	40	F	63	125	L	M	M	X
210	6	6	3	3	6	7	36	M	76	196	P	M	M	
211	7	5	7	5	5	5	38	F	61	149		H	M	
212	6	3	5	1	3	5	34	F	66	137		H	M	
213	7	6	7	3	4	5	50	F	66	126		M	M	
214	5	2	4	1	3	2	45	F	66	135	P	M	M	X
215	6	3	7	3	5	4	38	M	73	170		M	M	
216	4	3	5	2	3	3	32	F	64	148	P	M	L	X
217	6	5	5	6	5	6	37	F	64	116	P	M	M	X
218	4	3	4	3	2	2	35	F	70	200	L	H	H	
219	7	6	5	4	5	3	33	M	63	165	L	M	M	X
220	7	4	6	4	2	4	39	F	63	159	P	M	M	
221	6	5	7	6	4	3	27	F	62	117		M	M	
222*	5	5	6	4	4	4	37	F	64	133	P	M	L	
223	7	6	7	3	5	1	48	F	61	143		M	M	
224	7	3	5	5	3	4	31	F	66	128		H	H	
225	6	3	7	5	4	2	34	F	63	171	L	M	L	X
226*	7	4	6	6	5	4	49	F	64	146		M	M	

Abilities 1 = Static Strength
2 = Trunk Strength
3 = Stamina
4 = Extent Flexibility
5 = Dynamic Flexibility
6 = Mobility

* = Supervisor

OJI = History of on-the-job injury of low back
PLBP = Previous low back problems
PEH = Previous employment history
LA = Leisure activities

P = Pain and limitation of function
L = Pain and lost work time (PLBP)
S = Surgery
L = Low physical activity (LA)
M = Moderate activity
H = High activity

APPENDIX H

HEALTH CARE PROFESSIONALS

MEDICAL STANDARDS DATA

TABLE H - 1

MEDICAL STANDARDS DATA
CATEGORY A

#	Ability -	PLBP 123456	PSA 123456	PSU 123456	SCO 123456	SPO 123456
1		777767	655656	565655	546656	777757
2		676777	676766	676666	776657	777777
3		757547	777777	564665	777777	556557
4		776756	665656	656646	556655	466567
5		767767	655446	444334	776547	765547
6		777777	777777	777777	777777	777777
7		556657	556656	556656	666667	666667
8		776767	666566	565656	677667	677777
9		777777	677547	677657	567446	777667
10		666667	766656	545435	545555	546446
11		655447	555436	545436	544335	555435
12		767677	557667	566667	777677	667667
13		777767	666756	555555	666666	444444
14		646557	645447	445337	334226	663316
15		665767	665677	665577	765556	666657
16		556656	655555	556666	445544	556556
17		776767	766767	555555	666555	776767
18		766567	666667	545566	566556	665456
19		765656	665556	555555	666556	555555
20		776777	776777	776777	777777	776777
21		676667	566656	666666	666667	666667
22		767667	666667	666667	767777	777677
23		666556	555545	666556	545433	334323
24		666777	666666	665666	767666	666666

PLBP = Previous low back pain
PSA = Previous sciatica
PSU = Previous surgery
SCO = Scoliosis
SPO = Spondylolisthesis

#1-9 Ortho/Neuro
#10-18 GP
#19-24 PT

TABLE H - 2

MEDICAL STANDARDS DATA
CATEGORY B

#	Ability -	PLBP 123456	PSA 123456	PSU 123456	SCO 123456	SPO 123456
1		435455	435434	434444	435434	434534
2		444555	444434	444344	444434	555555
3		434325	657647	342454	666756	345335
4		444545	444444	435444	335344	345435
5		545435	333224	222213	444324	443324
6		345354	344355	445555	445544	444545
7		445344	435344	445343	445456	445456
8		445445	444435	433444	445444	445445
9		355356	347435	466334	244335	556445
10		335324	333334	223223	223333	324334
11		434225	334224	323224	323223	334223
12		545446	334445	435443	545444	445434
13		544545	443445	333333	555555	234444
14		534346	433236	333226	323115	332211
15		354544	354456	565556	443445	544556
16		344335	435434	444455	333323	444335
17		555655	555555	444444	554444	554545
18		544545	334344	333344	444444	445434
19		433334	343333	333333	433333	333333
20		545534	545534	535434	535444	535434
21		423443	335445	544443	455445	443434
22		434434	444334	445344	444344	444545
23		444334	333324	444334	323322	223112
24		545355	545544	445444	445544	454436

PLBP = Previous low back pain
PSA = Previous sciatica
PSU = Previous surgery
SCO = Scoliosis
SPO = Spondylolisthesis

#1-9 Ortho/Neuro
#10-18 GP
#19-24 PT

TABLE H - 3

MEDICAL STANDARDS DATA
CATEGORY C

#	Ability -	PLBP 123456	PSA 123456	PSU 123456	SCO 123456	SPO 123456
1		223332	223322	223321	212222	222322
2		122213	221111	111111	121111	222222
3		213113	324425	131233	235634	224113
4		222333	222223	223222	224222	122223
5		212113	111112	111112	222212	222212
6		223233	323222	223322	323222	322222
7		222212	222212	223332	323345	323346
8		222222	222322	222222	232222	222222
9		245356	347435	366223	243225	445345
10		223213	222222	112112	112222	212212
11		122112	112112	111111	111111	112112
12		323235	223223	323221	333323	223222
13		332221	321221	221111	333343	122211
14		222224	222223	222223	222112	131111
15		232412	231233	333342	322232	332323
16		132212	233214	222222	212212	323213
17		223323	333333	223322	332222	332323
18		232222	222223	232232	222122	232222
19		222212	122211	112211	221112	111111
20		333333	333333	333333	333333	333333
21		221221	323131	321222	222232	241222
22		212212	222213	221212	233222	222222
23		233222	222222	223222	212211	112111
24		112113	121312	111122	234222	212213

PLBP = Previous low back pain
PSA = Previous sciatica
PSU = Previous surgery
SCO = Scoliosis
SPO = Spondylolisthesis

#1-9 Ortho/Neuro
#10-18 GP
#19-24 PT

APPENDIX I

HUMAN SUBJECTS APPROVAL LETTERS

THE UNIVERSITY OF TENNESSEE
KNOXVILLE

Office of the
Vice Provost
for Research

CRP #: 3033 A DATE: 07/07/89

Title: Back Disability Medical Standards Project

Turner, John Charles
Health, Leisure & Safety
1528 La Paloma Drive
Knoxville, TN 37923

Neutens, Dr. James
Health, Leisure & Safety
384 HPER Bldg.
Campus

Dear Mr. Turner:

The project listed above has been certified exempt from review by the Committee on Research Participation and is approved.

This certification is for a period ending one year from the date of this letter. Please make timely submission of renewal or prompt notification of project termination (see item #2 below).

The responsibilities of the project director include the following:

1. Prior approval from the Vice Provost for Research must be obtained before any changes in the project are instituted.

2. Submission of a Form D at 12-month intervals attesting to the current status of the project (protocol is still in effect, project is terminated, etc.).

We wish you success in your research endeavors.

Sincerely,

Edith M. Szathmary
Coordinator of Compliances

cc: Dr. Charles Hamilton
373 HPER Bldg.
CRP file

Attachment: Copy of Form A

THE UNIVERSITY OF TENNESSEE
MEDICAL CENTER AT KNOXVILLE

Office of Institutional Review Board
1924 Alcoa Highway
Knoxville 37920-6999
(615) 544-9463

June 26, 1989

John Turner, M.D.
University of Tennessee
Health, Leisure and Safety (UTMC/K Emergency Medicine)
1914 Andy Holt Avenue
Knoxville, Tennessee 37996-2700

Subject: Protocol (IRB #0034) "Back Disability Medical Standards Project"

Dear Dr. Turner:

Your research study entitled "Back Disability Medical Standards Project" (IRB #0034) has been administratively reviewed and approved.

Your research application will be reviewed in one year, and you are reminded that you have individual responsibility for reporting to the committee in the event of any adverse reactions of the study.

We appreciate your informing us of this project.

Sincerely,

Joseph E Fuhr/ed

Joseph E. Fuhr, Ph.D.
Chairman, Institutional Review Board Office

JEF:ed

VITA

John Charles Turner was born in Toronto, Ontario, Canada in 1950. He attended Carleton University in Ottawa, Ontario, graduating in 1973 with an Honors Bachelor of Science degree in Biology. Following this, he was accepted into the medical college at McMaster University in Hamilton, Ontario, graduating with the degree Doctor of Medicine in 1977. From 1977 to 1979 he completed a residency program in Family Medicine, also at McMaster University. A second residency program, this time in Emergency Medicine, was completed in 1980 at the University of Ottawa in Ottawa, Ontario.

In 1980 he moved to Knoxville, Tennessee where he entered the full-time practice of emergency medicine. During this period of mostly crisis intervention, he realized the importance of the prevention of disease and illness. As a result, he entered the University of Tennessee at Knoxville and graduated with a Master of Science degree in School Health in 1983, and a Master of Public Health degree in 1986. Continuing his studies, he was awarded the Doctor of Philosophy degree in Education with a major in Health Education and Public Health in 1989 also from the University of Tennessee at Knoxville.

He is board certified in Preventive Medicine and Public

Health, Family Medicine and Emergency Medicine. He is also a member of several professional associations and societies.

Recognizing the need to educate both the public and the medical community on the benefits of preventive medicine, he will pursue both an academic and clinical career in the Knoxville area.