PREDICTING INJURY AMONG NURSING PERSONNEL USING PERSONAL RISK FACTORS

A Thesis

by

IVAR HENRY GJOLBERG, JR.

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

December 2003

Major Subject: Safety Engineering

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Approved as to the style and content by:

J. Steven Moore (Co-Chair of Committee)	Jerome Congleton (Co-Chair of Committee)
Omer Jenkins (Member)	William E. Burchill (Head of Department)

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ABSTRACT

Predicting Injury Among Nursing Personnel Using

Personal Risk Factors. (December 2003)

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Co-Chairs of Advisory Committee: Dr. J.S. Moore
Dr. J. Congleton

The purpose of this thesis was to develop a means of predicting future injury among nursing personnel working in a hospital system. Nursing has one of the highest incidence rates of musculoskeletal injuries among U.S. occupations. Endemic to the job are tasks such as rolling, sitting, standing, and transferring large, and often times, uncooperative patients. These tasks often place large biomechanical stresses on the musculoskeletal system and, in some cases, contribute to or cause a musculoskeletal injury. Given the current nursing shortage, it is imperative to keep nurses injury-free and productive so they can provide patient care services. Even though a large number of nursing personnel are injured every year and most are exposed to these high levels of biomechanical stress, the majority of nurses are injury-free. The question then arises "Why do some nurses have injuries while others do not?" The purpose of this thesis was to determine whether individual attributes in a population of nurses were associated with risk of future injury. The subject population was comprised of 140 nursing personnel at

a local hospital system hired between April 1995 and February 1999. Data on individual attributes, such as patient demographics, previous injuries, posture, joint range of motion, flexibility, and muscular strength, was ascertained during a post-offer screening on these personnel. Twenty six (19%) nurses experienced an injury associated with the axial skeleton. Chi square test for homogeneity for the categorical predictor variables, and the Student's T-test for continuous predictor variables were used to determine if any individual attributes were associated with future injuries. None of the variables were associated with a risk of future axial skeletal injury. Practical application of these results for St. Joseph Regional Health Center, and possibly other acute care facilities, directs us to stop costly pre-employment/post-offer testing for the purpose of identifying injury prone nurse applicants. Secondly, it allows the focus of limited resources to be on making the job safer through administrative and engineering controls.

ACKNOWLEDGEMENTS

I would like to acknowledge Dr. J. Steven Moore, for his guidance and wisdom, and the wealth of knowledge he possess and freely shares. I want to thank Dr. Jerry Congleton for letting me into the program even though I did not fit the typical student model. I would like to thank Dr. Gordon Vos, who walked me through the valley of statistics. I want to acknowledge St. Joseph Regional Health Center, and especially Dan Buche CEO, for allowing me access to his employees and for providing me both the financial resources and time to undertake this project. Lastly, I would like to thank my wife, Donna, who has been a tremendous help for me through her support and prayers.

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INTRODUCTION

Health care facilities have been identified as an environment where ergonomic stressors exist[1]. St. Joseph Health System, a small hospital system in Bryan, Texas, is no exception. This system struggles with musculoskeletal injuries among its workers in the acute care, rehabilitation, and long-term care facilities. These injuries affect a broad spectrum of hospital workers but none more than nursing personnel. The nursing profession, including registered nurses (RN), general nurses (GN), licensed vocational nurses (LVN), and certified nurses aides (CNA), has one of the highest incidence rates of musculoskeletal injuries among U.S. occupations.[2] Endemic to the job are tasks such as rolling, sitting, standing, and transferring large, and often times, uncooperative patients. These tasks often place large biomechanical stresses on the musculoskeletal system and, in some cases, contribute to or cause a musculoskeletal injury.[3,4,5]

Strategies that can eliminate or reduce worker injuries will add directly to the bottom line of St. Joseph Hospital. This is advantageous as the hospital continues to struggle financially with increasing numbers of uninsured, reduced reimbursement at both the federal and state level, and rising cost of labor and new technologies. With that it is difficult to convince administration to proactively spend limited financial resources with the hope of saving future dollars lost through worker injury or illness. To further add to means increased costs due to overtime or contract staff, or to a revenue loss from a

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This thesis follows the style and format of *Physical Therapy*.

reduction in patient days to maintain acceptable patient nurse ratios. Even though a large number of floor nursing personnel are injured every year and most are exposed to these high levels of biomechanical stress, the majority of nurses remain injury-free.[6,7] The question then arises "Why do some nurses have injuries while others do not?" This paper explores the possibility that personal attributes in a small population of nurses at a local acute care facility are associated with risk of future injury. If this is the case, screening of qualified nursing personnel can lead to early identification and perhaps injury prevention through risk factor reduction and/or biomechanics education.

Present Status of the Question

Prior studies have reported evidence of positive association between personal attributes and risk of future musculoskeletal injuries within general industry. Poor isometric endurance, hypermobility of the lumbar spine, worker strength less than job requirements, decreased vertebral canal size, age, length of employment, recent appraisal ratings, lack of exercise and smoking were risk factors for future musculoskeletal injury.[8,9,10,11,12,13] In the specific area of nursing even less research has been done on prognostic indicators. Venning et al[14] found that a previous history of back injury was the only personal factor associated with an increased incidence of back injuries. Ready et al[15] looked at performance on fitness and back-related isometric tests, and responses to a lifestyle questionnaire of 119 nurses. They found prior compensation, smoking status, and job satisfaction were the most useful predictors for future musculoskeletal injury.

METHODS

Location

This study was conducted at St. Joseph Regional Health Center in Bryan, TX. The study population was composed of employment applicants seeking a nursing position with patient care responsibilities. These positions were licensed and non-licensed and included Registered Nurses, Graduate Nurses, Licensed Vocational Nurses, and Certified Nursing Assistants.

Hiring Process

When employees are hired at St. Joseph Regional Health Center, they must go through a multi-step process. After a Nurse Manager or Department Director decides to hire an individual, the prospective employee is offered a position and scheduled for a drug screen, musculoskeletal screen and physical examination. The physical therapy department performs the musculoskeletal screen (described below). Those individuals failing to meet the lifting essential function test are also eliminated. Finally, a Physician Assistant or Physician performs a basic physical examination to complete the process. The last step has no input into this study.

Musculoskeletal Screen Testing Protocol

The Musculoskeletal Screen involves the evaluation of individual anthropometric characteristics, functional performance, and a test for the ability to perform one essential function (lifting). The primary purpose of the Musculoskeletal Screen is to collect

baseline information on new employees in an effort to limit liability of the employer in the event the employee sustains an injury that results in some impairment. The secondary purpose of the screen is to determine if the employee has the potential to be a direct threat to themselves or others (related to the Americans with Disabilities Act). The essential function test is to ensure the employee is capable of performing an essential function of the job that may otherwise pose a risk of injury and permanent impairment. For this study, the essential function task of lifting was chosen. The Dictionary of Occupational Titles defines the strength requirement of nursing as medium, lifting up to 50 lbs on an occasional basis.[16]

The Musculoskeletal Screen is broken down into the following eight categories: (see Appendix A)

1. Patient demographics (name, gender, age, weight, social security number, job title, and department);
2. Injury questionnaire (history of musculoskeletal injuries and current limitations);
3. Standing posture and gait;
4. Active range of motion (cervical spine, lumbar spine and extremities);
5. Hamstring flexibility;
6. Manual muscle testing (upper and lower extremities);
7. Timed exercise performance (pushups, sit-ups, and lumbar extensions for sixty seconds); and
8. Self-limiting lifting test (floor to 48 inches with critique of lifting technique).

The demographic and injury information are self-reported. Weight was measured by an examiner (a physical therapist). The assessments of posture, gait, range of motion, flexibility, muscle strength testing, timed exercise, and the self-limited lifting test are administered by the physical therapist with results based on observations, subjective ratings, numerical counts, or measurements made by the examiner. Details regarding the administration and rating of these assessments are in Appendix B.

Injury Data

Injury data was collected from the Employee Injury Report Form that each employee is compelled to fill out following an on-the-job injury if they want it covered under the St. Joseph Safety Program. The injury reports were reviewed and only those incidents related to a normal physical work function, as defined in Section D below, were considered. Injuries were categorized as either axial or appendicular. Axial injuries include injuries to the low back/hip, neck or shoulder. Appendicular injuries include injuries to the hand/wrist/ elbow, knee or ankle. The case definition for inclusion in the analysis were those individuals who had an axial injury occur while performing a normal physical work function, all others were controls. A data collection sheet was developed to record information from the injury report form (Appendix C). It is divided into 7 sections.

Section A Information on the employee name, social security number, date of their initial screen, date of injury, and the latency period between the two.

Section B Identifies the primary body part injured (low back/hip, neck, shoulder, hand/wrist/elbow, knee, and ankle)

Section C Identifies the secondary body part injured (same body parts).

Section D Categorizes what the employee was doing when injured and is divided into 4 sub-categories:

- Vertical Lift Injury- this would include lifting/transferring a patient or object from one point to another in the vertical plane. Not more then one step taken.
- Horizontal Pull Injury-this would include pulling/rolling a patient or object in the horizontal plane, bringing them toward you.
- Horizontal Push Injury- this would include pushing/rolling a patient or object in the horizontal plane away from you.
- Carrying- this would include carrying a patient or object for a minimum of two steps.

Section E Identifies what the employee was working with when they were injured (patient, object, gurney/wheelchair or other).

STATISTICAL METHOD

Subjects were grouped into two categories – cases were those subjects who had an axial injury, controls were those subjects that did not. Nominal and ordinal predictor variables with multiple responses were dichotomized into normal versus abnormal. Predictor variables related to the same body part were combined into a single predictor variable, normal versus abnormal. If any individual had a positive finding under any of the initial variables they were considered abnormal under the new variable. The two new variables created were spine composite, normal or abnormal, and hip composite, normal or abnormal.

Spine composite- normal/abnormal

- Shoulder- equal/not equal
- Inferior scapula- equal/not equal
- Distance of UE from trunk- equal/not equal
- Scoliosis- positive/negative

Hip composite- normal/abnormal

- Hip flexion R/L- normal/limited
- Hip internal rotation R/L- normal/limited
- Hip external rotation R/L- normal/limited
- FABER test R/L- positive/negative

Categorical predictor variables were analyzed using the chi square test for homogeneity with the null hypothesis being the attributes were equally distributed. Alpha was set at 0.05 and no adjustments were made for multiple comparisons. Continuous variables were analyzed for equality of means using the Student's T-test. All analyses were performed using SPSS for Windows, version 10.0.5. copyright 1999. Individuals with missing data were a relatively uncommon occurrence (a maximum of 3 for any predictor variable). Data missing from the Musculoskeletal Screen was either due to failure of the participant to complete the questionnaire, refusal to perform some aspect of the screen, or the examiner omitting some aspect of the screen due to health or safety concerns. Subjects with missing data were excluded from analysis for that particular predictor variable.

RESULTS

Description of Cohort

The study group consisted of 140 new hires. There were 13 males (9.3%), and 127 females (90.7%). Ages ranged from 20–60 years with a mean of 33 years.

Injury Case Statistical Analysis

There were 29 injuries (20.7%) and 111 non-injuries (79.3%). Looking at the primary body part injured, 21 cases (72.4%) were low back/hip, 2 cases (6.9%) were neck, 3 cases (10.3%) were shoulder, and 3 cases (10.3%) were hand/wrist/elbow. When body part injuries were re-defined as either axial or appendicular, 26 cases (89.6%) were axial, and 3 cases (10.4%) were appendicular. When looking at what the employee was doing when injured, 15 (51.7%) were performing a vertical lift, 10 (34.5%) were performing a horizontal pull, 1 (3.4%) was performing a horizontal push, 2 (6.9%) were performing a carry, and 1 (3.4%) were unknown. When looking at what the nurse was working with at the time of injury, 22 (75.9%) were with a patient, 6 (20.7%) were with an object, and 1 (3.5%) were other. The time between their pre-employment screen and their injury ranged from 1 to 46 months with an average of 17.8 months. Of those injured 9 cases (31%) were placed on restricted duty with a range of 1-17 days, and an average of 8.4 days. Of those injured 5 cases (17.2%) had lost days with a range of 1-90 days and an average of 20.6 days.

Demographics

Section I had no association between predictor variables for cases and controls (see Table 1).

Table 1.
Demographics of the 140 individuals participating in the study

Variable	Individuals with axial injuries N=26	Individuals without axial injuries N=114	p-value
Gender-female	24 (92.3%)	103 (90.4%)	1.00
Age(years)	31.6 (9.6%)	33.5 (9.2%)	0.31
Weight(lbs)	166.9 (41.5%)	159.6 (44.1%)	0.43

Injury History

Section II asked specifically about previous back injury and back surgery, followed by whether there had been any pain, injury or surgery to seven other body areas. Section II had no association between predictor variables for cases and controls (see Table 2).

Table 2.
Injury History of the140 participants

Variable	Individuals with axial injuries N=26	Individuals without axial injuries N=114	p-value
Back injury	5 (19%)	18 (16%)	0.77
Back surgery	1 (3%)	2 (2%)	0.46
Neck	4 (15%)	15 (13%)	0.76
Shoulder	2 (8%)	14 (12%)	0.74
Elbow	0	8 (7%)	0.35
Wrist	1 (3%)	20 (16%)	0.13
Hip	1 (3%)	6 (5%)	1.00
Knee	7 (27%)	18 (16%)	0.56
Ankle	3 (12%)	21 (18%)	0.57

Gait and Posture

Preliminary analysis of Section III revealed 5 tests with no abnormalities (type of gait, heel walk, toe walk, jump 3 times, and squat 10 times), therefore they were not included in subsequent analysis. Section B was combined to create the new variable, Spine- normal/abnormal. Section IV, active movements, also had tests with no abnormalities (cervical, lumbar, shoulder, elbow, wrist and finger range of motion), which were therefore excluded from subsequent analysis. Hip- normal/abnormal was created with the four remaining range of motion variables. Neither of the new variables was predictive of future injury (see Table 3- New Variables).

Table 3.
New Variables created by combining 4 related variables

Variable	Individuals with axial injuries N=26	Individuals without axial injuries N=114	p-value
Spine composite	12 (41%)	41 (36%)	0.93
Hip composite	4 (14%)	5 (4%)	0.06

Flexibility/Timed Exercise

Section V, flexibility, and section VII, timed exercise, had no significant difference in performance between cases and controls (see Table 4).

Table 4.
Flexibility and Timed Exercise

Variable	Individuals with Axial Injury N=26 mean(SD)	Individuals Not Injured N=114 mean(SD)	p-value
Hamstring length, right	166.65(8.59)	163.9(11.85)	0.266
Hamstring length, left	167.62(7.51)	164.04(12.34)	0.159
Back extensions	47.42(12.65)	46.66(12.79)	0.785
Time at which employee stopped back extensions	58.84(3.42)	57.07(7.16)	0.23
Abdominal crunches	41.81(10.84)	43.58(11.19)	0.464
Time at which employee stopped abdominal crunches	55.88(8.14)	57.76(6.21)	0.203
Pushups	22.5(10.74)	26.27(9.21)	0.229
Time at which employee stopped regular pushups	48.52(12.69)	51.45(12.58)	0.315

Lifting Technique

Section VIII had no significant difference between cases and controls (see Table 5).

Table 5.
Lifting Technique

Variable	Individuals with Axial Injury N=26	Individuals Not Injured N=114	p-value
Base of Support-narrow	10 (38%)	41 (41%)	0.12
Type of lift-twisted	0	2 (2%)	0.47
Foot distance from object- too far	5 (19%)	25 (23%)	0.15
Squat when lifting-shallow	2 (8%)	6 (5%)	0.65
Lowback position-kyphotic	6 (23%)	25 (23%)	0.90

DISCUSSION

In this study individual attributes were found not to be predictive of future injury. This is consistent with Ready et al[14] who also found no association between performance related tests and injury. This study does not support Venning et al[15] findings of an association between previous history of back injury and future back injury. These results are consistent with the inference that job related factors are more relevant to future injury then personal attributes.

Though none of the variables met the criterion of statistical significance, it was noted that the abnormal hip composite had a p-value of 0.062 . This variable was made up of three hip range of motion variables- hip flexion, hip internal rotation and hip external rotation, and the FABER test (the FABER test had no variability, and therefore has no association with future injury). The axial injury that the hip composite variable was associated with was low back. When examining what the employee was doing when injured the results were equally distributed between vertical lift, horizontal pull and carry. This may suggest some association between these anatomically close body parts but further investigation into the cause and effect with a larger population will be needed.

Limitations to this study include a small number of participants, lack of measuring other personal attributes potentially indicative of future injury, and exposure based on job category as opposed to the actual extent of job stress. Strengths to this study are its

prospective and longitudinal nature. In considering any future studies, some additional variables that may be of predictive value include percent body fat, aerobic capacity, static back extension time and smoking.

CONCLUSION

Practical application of these results for St. Joseph Regional Health Center, and possibly other acute care facilities, directs us to stop costly pre-employment/post-offer testing for the purpose of identifying injury prone nurse applicants. Secondly, it allows the focus of limited resources to be on making the job safer through administrative and engineering controls. This is consistent with OSHA's newly released "Guidelines for Nursing Homes- Ergonomics for the Prevention of Musculoskeletal Disorders"[1], which recommend that manual lifting of patients be minimized in all cases and eliminated whenever possible. OSHA notes that providing a safer and more comfortable work environment has also resulted in additional benefits for some healthcare facilities, including reduced staff turnover and associated training and administrative costs, reduced absenteeism, increased productivity, improved employee morale, and increased patient comfort. These benefits will directly impact the bottom line of a healthcare facility, which is what is needed in today's economy.

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APPENDIX A

SJRHC
Musculoskeletal Baseline Information

I. Name:_____ Sex: M F Date:_____

Job Title:_____ Dept.:_____

SS#:_____ Age:_____ DOB:_____

Blood pressure:_____ Weight:_____

II. 1. Have you ever been told you have a heart condition? yes no

Comments:_____

2. Have you ever been told you were diabetic/hypoglycemic? yes no

Comments:_____

3. Have you ever had a back injury with pain lasting more than 2 days?

yes no

Comments:_____

4. Have you ever had back surgery? yes no

Comments:_____

5. Have you ever had pain, injury, or surgery to any of the following areas?

Neck	yes	no	Hip	yes	no
Shoulder	yes	no	Knee	yes	no
Elbow	yes	no	Ankle	yes	no
Wrist	yes	no			

Comments:_____

6. This screen includes activities of lifting, pushing, pulling, bending, reaching, and timed exercise. To your knowledge are you unable or prohibited from performing these activities of your own volition or by a physicians restrictions?

YES **NO**

Signature:_____ Date:_____

Witness:_____ Date:_____

III. Posture Analysis

A. Gait: ☐ Normal ☐ Guarded ☐ Limp (L) ☐ Limp (R)

Heel walk (10ft. backwards) (R) ☐ able ☐ unable (L) ☐ able ☐ unable

Toe walk (10ft.) (R) ☐ able ☐ unable (L) ☐ able ☐ unable

Jump (3 times) (R) ☐ able ☐ unable (L) ☐ able ☐ unable

Squat (90°, 15 times) ☐ able ☐ unable

B. Standing (back exposed)

Shoulder height ☐ equal ☐ unequal, lower on _____

Inferior scapular angle ☐ equal ☐ unequal, lower on _____

Pelvis (iliac crest) ☐ equal ☐ unequal, lower on _____

Distance of UE from trunk ☐ equal ☐ unequal, further on ____

Scoliosis: ☐ normal ☐ cervical ☐ thoracic ☐ lumbar

Comments:_____

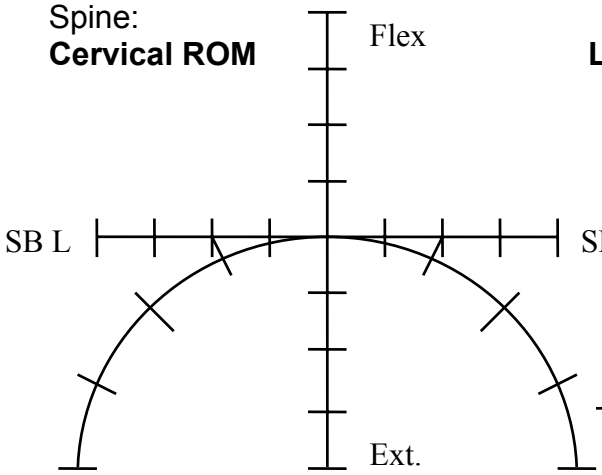
_____

_____

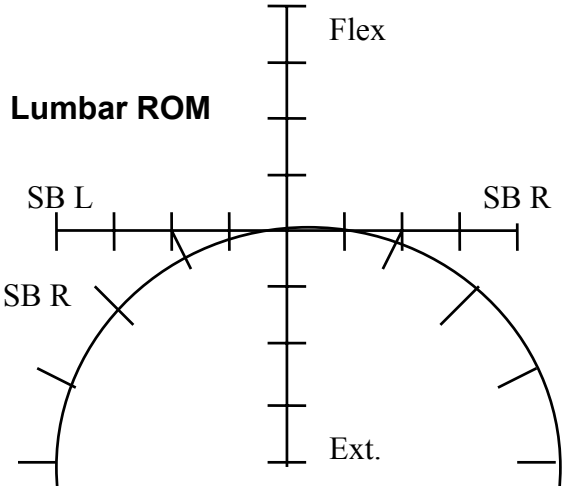
IV. Active Movements

Spine:

Cervical ROM



Lumbar ROM



Comments: _____

_____

_____

Extremity Functional Motion

	Right			Left		
	WNL	Limited	Painful	WNL	Limited	Painful
Shoulder flex						
ext.						
int. rot						
ext. rot						
Elbow flex						
ext.						
pro.						
sup.						
Wrist flex						
ext.						
uln.						
rad.						
Fingers						
Hip flex						
ext.						
int. rot						
ext. rot						
Faber Test						

V. Flexibility

1. Hamstring (supine, hip flexed 90°, active knee extension)

Right _____ Left _____

Key:	Poor	Below Avg.	Average	Above avg.	Superior
Hamstring	<136	136-150	151-170	171-175	>175

Comments:_____

_____

VI. Neurologic/Strength

	Right	Left		Right	Left
L_1-L_2 Psoas			Shld Abd. C_5		
L_3 Quads			Bicep C_5		
L_4 Ant. tib.			Wrist ext. C_6		
L_5 EHL			Tricep C_7		
S_1 FHL			Thumb C_8		
S_2 Hams			Intrinsics T1		
Grip #3			Key: (N)ormal (W)eak		

VII. Timed Exercise (must be continuous in a one minute time frame)

1. Back Extension (prone hands behind head) _____
2. Abdominal Crunches (hands behind head, knees flexed) _____
3. Push-ups (elbows must go to full extension and 90 of flexion) _____

Strength Key:	Poor	Below Avg.	Average	Above avg.	Superior
Back ext.	<26	26-38	39-51	52-66	>66
Crunches	<11	11-22	23-44	45-54	>54
Push-ups	<6	6-14	16-30	31-42	>42

Comments:_____

_____

_____

_____

VIII. Lifting Technique Assessment: SJRHC

Evaluee must lift a weighted box from floor to waist take several steps and place it on the shelf. He/she must then return the box to the originating point. The evaluee will attempt to do the most they feel they can do, NO ENCOURAGEMENT IS GIVEN TO DO MORE. The test will terminate when the evaluee has reached the required weight, when they feel they can do no more, or if the examiner has concern with the evaluee's ability.

A. Body Mechanics (preferred lifting technique) with 20 lbs.

Base of Support:	☐ *Narrow*	☐ Wide	
Type of Lift	☐ Straight	☐ Diagonal	☐*Twisted*
Foot Distance from Object:	☐ Appropriate	☐ *Too Far*	
Squat:	☐ Deep	☐ *Shallow*	
Back Position	☐ *Kyphosis*	☐ Lordosis	☐Straight

B. Instruction/reinforcement given for proper body mechanics ☐ yes ☐ no

C. Evaluee's maximum lift was _____ lbs. to 48 inches. (see chart)

D. Evaluee performed 10 repetitions with 50% of the max weight lifted.

Weight:_____

Maintained proper body mechanics ☐ yes ☐ no

Endurance: ☐ poor ☐ fair ☐ good ☐ excellent

Conclusion/Recommendations:

_____

_____

_____

_____

_____

_____

_____ _____

Evaluator's signature Date

APPENDIX B

The patient supplies the majority of patient demographic information. This would include their name, sex, date of birth, job title, and department. Additional demographic information collect by the examiner includes weight and blood pressure. A standard medical scale, stethoscope and sphygmomanometer were used for these.

I. Name:_____ Sex: M F Date:_____

Job Title:_____ Dept.:_____

SS#:_____ Age:_____ DOB:_____

Blood pressure:_____ Weight:_____

Section II asked yes/no questions regarding any previous injuries or medical conditions and any current work restrictions. These questions are as follows:

II. 1. Have you ever been told you have a heart condition? yes no

2. Have you ever been told you were diabetic/hypoglycemic? yes no

3. Have you ever had a back injury with pain lasting more than 2 days? yes no

4. Have you ever had back surgery? yes no

5. Have you ever had pain, injury, or surgery to any of the following areas?

Neck	yes	no	Hip	yes	no
Shoulder	yes	no	Knee	yes	no
Elbow	yes	no	Ankle	yes	no
Wrist	yes	no			

6. This screen includes activities of lifting, pushing, pulling, bending, reaching, and timed exercise. To your knowledge are you unable or prohibited from performing these activities of your own volition or by a physicians restrictions? **YES** **NO**

Signature:_____ Date:_____

Witness:_____ Date:_____

Section III, the analysis of standing posture and gait is used to screen for any abnormalities in gait that could be caused by either a skeletal asymmetry, muscular weakness or neurologic problem. The areas of observation and data collection options consist of the following:

III. A. Gait: ☐ Normal ☐ Guarded ☐ Limp (L) ☐ Limp (R)

Heel walk (10ft. backwards) (R) ☐ able ☐ unable (L) ☐ able ☐ unable

Toe walk (10ft.) (R) ☐ able ☐ unable (L) ☐ able ☐ unable

Jump (3 times) (R) ☐ able ☐ unable (L) ☐ able ☐ unable

Squat (90°, 15 times) ☐ able ☐ unable

B. Standing (back exposed)

Shoulder height ☐ equal ☐ unequal, lower on ___

Inferior scapular angle ☐ equal ☐ unequal, lower on ___

Pelvis (iliac crest) ☐ equal ☐ unequal, lower on ___

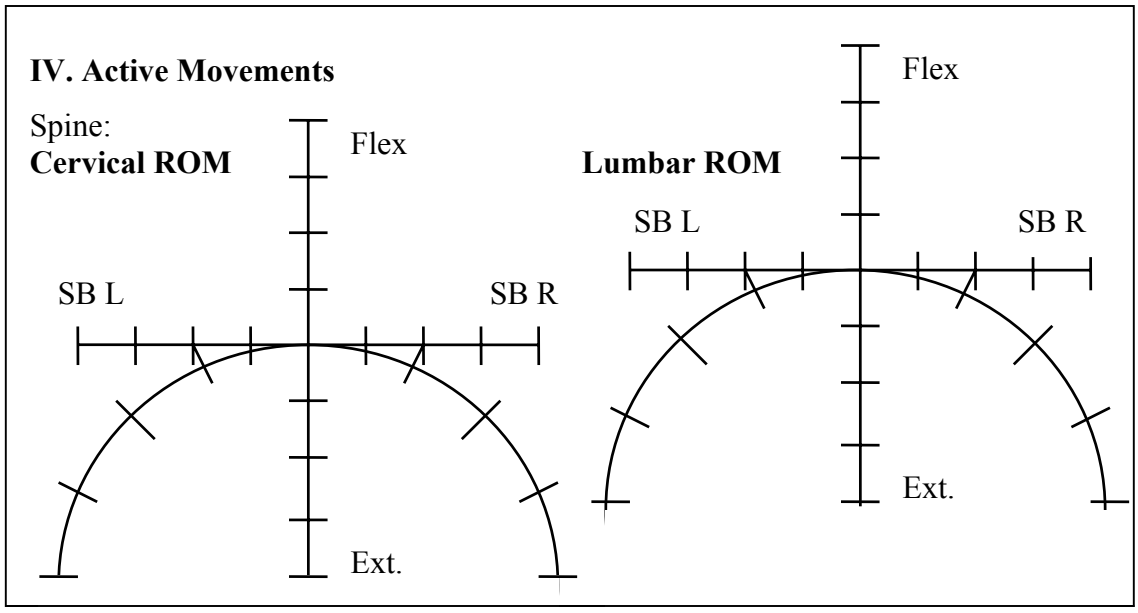
Distance of UE from trunk ☐ equal ☐ unequal, further on _

Scoliosis: ☐ normal ☐ cervical ☐ thoracic ☐ lumbar

The analysis of the employees gait can lead to one of 3 responses; normal, guarded, or limp right or left. A gait pattern that is guarded is indicative of pain in the lower extremity or back. A limp on either leg can be indicative of either a leg length discrepancy or pain in the lower extremity or back. Heel walking and toe walking is used to see if there is any lower leg weakness in the ankle dorsiflexors or plantar flexors, respectively. This might be indicative a muscle wasting disease or neurologic problem. Jumping and squatting is used to rule out any gross pathology in the ankle, knee, hip and low back complex. It can also give insight into balance disorders and lower extremity fitness. Observation of the exposed back is looking for gross pathology, asymmetries

and scoliosis. You can also view any surgical scars which should have been disclosed in section I.

Section IV Active range of motion of the cervical and lumbar spine and upper and lower extremities. The purpose of the first half of this section is to, through observation, document in a gross manner flexion/extension, rotation and side bending of the cervical and lumbar spine. The tick marks represent 25%, 50%, 75%, and 100% of the expected range of motion for that direction. The employee is tested in the standing position and observations are made from the best viewing angle.



The second half of this section is to make a gross estimate of range of motion for the upper and lower extremities. The observer has three selection choices; WNL- within normal limits is the box selected if the extremity moves through the range expected,

Limited- is selected if the range is less than expected, Painful- is selected if any part of the range is viewed as painful. The upper extremities are tested in the standing position and the lower extremities are tested in the supine position. The Faber Test, standing for hip flexion, abduction, and external rotation, is a quick screen looking for hip pathology and sacroiliac(SI) joint dysfunction. The employee is in the supine position with one leg crossing the other in a figure 4 pattern. Slight downward over pressure is applied to the knee of the crossed leg while the opposite hip is stabilized. A positive test results in painful complaints in the SI area of the low pack, or pain in the hip joint other then stretch pain. The FABER test screens for hip joint pathology and sacroiliac joint dysfunction. You position the employee in a supine position, you then flex, abduct, and externally rotate the hip placing the foot or ankle just above the opposite knee. Stabilizing the leg at the ankle overpressure is applied at the knee in the posterior direction. Complaints of pain in the hip joint, other then stretch discomfort, and complaints of pain in the sacroiliac joint area are positive responses.

Extremity Functional Motion

	Right			Left		
	WNL	Limited	Painful	WNL	Limited	Painful
Shoulder flex						
ext.						
int. rot						
ext. rot						
Elbow flex						
ext.						
pro.						
sup.						
Wrist flex						
ext.						
uln.						
rad.						
Fingers						
Hip flex						
ext.						
int. rot						
ext. rot						
Faber Test						

Section V- Flexibility is looking at the flexibility of the hamstring musculature. The employee is in the supine position with the hip and knee both in 90° of flexion. A manual goniometer is placed on the lateral aspect of the knee and is aligned using standard goniometric methods for measuring knee range of motion. The employees hip is maintained at 90° while the knee is extended to its' maximal point and the range of motion in degrees is read.

V. Flexibility

1. Hamstring (supine, hip flexed 90°, active knee extension)

Right _____ Left _____

Key:	Poor	Below Avg.	Average	Above avg.	Superior
Hamstring	<136	136-150	151-170	171-175	>175

Section VI- Neurologic and Strength is looking for any weaknesses in selected muscle groups of the upper and lower extremities. These particular muscles were selected based on their nerve root innervations and their corresponding spinal level. Weakness could be indicative of muscle injury, joint pathology, nerve root compression, or muscle wasting disease. The muscles of the lower extremity are tested while the employee is in the sitting position on a plinth or high table allowing free movement of the legs. The upper extremity are also tested in the sitting position

VI. Neurologic/Strength

	Right	Left		Right	Left
L_1-L_2 Psoas			Shld Abd. C_5		
L_3 Quads			Bicep C_5		
L_4 Ant. tib.			Wrist ext. C_6		
L_5 EHL			Tricep C_7		
S_1 FHL			Thumb C_8		
S_2 Hams			Intrinsics T1		
Grip #3			Key: (N)ormal (W)eak		

Section VII Timed Exercise- is used to determine a basic muscular fitness level of the employee. Each exercise is performed for a maximum of 60 seconds or when the employee voluntarily stops due to fatigue of pain. Back extensions are performed lying prone on a plinth. The hands are placed behind the head and the tester stabilizes the lower extremities at the ankles. The employee is to repeatedly elevate the upper torso off the plinth using the lower back musculature for as many repetitions as possible. Abdominal crunches are performed lying supine on a plinth or mat with the knees flexed and the ankles stabilized by the tester. The hands are placed behind the head and the

individual is instructed to curl the trunk until the shoulder blades are lifted off the mat. Pushups are performed in the prone position on the floor or mat. Women are given the choice of regular or modified pushups, if modified pushups are performed it is noted to the side of the score. In regular and modified push ups the humerus is abducted to 90° and the elbow must bend to a minimum of 90° in the down position and be completely straight in the up position. The body is kept straight during the pushup with the feet together on the floor for regular pushup or the knees for modified pushups.

VII. Timed Exercise (must be continuous in a one minute time frame)

1. Back Extension (prone hands behind head) _____
2. Abdominal Crunches (hands behind head, knees flexed) _____
3. Push-ups (elbows must go to full extension and 90° of flexion) _____

Section VIII Lifting Technique Assessment- is used to see how the person lifts with no previous instruction. The tools for this are a lifting box with hand holds cut at 9 inches above the floor, unmarked sand bags with weight totally approximately 200 lbs and an adjustable shelving unit set at 37 inches above the floor. After the initial lift with 20 lbs the lifting technique is critiqued and instructions are given if the technique is unsatisfactory. The individual is then instructed to place weight in the box and lift it from the floor to the shelf, adding weight until they feel that is the most they can do safely. Following this half of the maximum weight lifted is taken for a repetitive lift and carry. The individual lifts the box from the floor, carries it 10 feet placing it on the shelf at 37 inches and then returns it to the starting point. This is repeated for 10 repetitions and a comment is selected for whether they maintained proper body mechanics and endurance. Lifting is an essential function for the nursing position and the physical demand requirement is 50 lb. If the individual does not lift 50 lb the employment offer is retracted.

VIII. Lifting Technique Assessment: SJRHC

Evaluee must lift a weighted box from floor to waist take several steps and place it on the shelf. He/she must then return the box to the originating point. The evaluee will attempt to do the most they feel they can do, NO ENCOURAGEMENT IS GIVEN TO DO MORE. The test will terminate when the evaluee has reached the required weight, when they feel they can do no more, or if the examiner has concern with the evaluee's ability.

A. Body Mechanics (preferred lifting technique) with 20 lbs.

Base of Support:	☐ *Narrow*	☐ Wide	
Type of Lift	☐ Straight	☐ Diagonal	☐*Twisted*
Foot Distance from Object:	☐ Appropriate	☐ *Too Far*	
Squat:	☐ Deep	☐ *Shallow*	
Back Position	☐ *Kyphosis*	☐ Lordosis	☐Straight

B. Instruction/reinforcement given for proper body mechanics ☐ yes ☐ no

C. Evaluee's maximum lift was _____ lbs. to 48 inches. (see chart)

D. Evaluee performed 10 repetitions with 50% of the max weight lifted. Weight:_____

Maintained proper body mechanics ☐ yes ☐ no

Endurance: ☐ poor ☐ fair ☐ good ☐ excellent

APPENDIX C

Data Collection Tool for
Predicting Injury Among Nursing Personnel Using Personal Risk Factor

Employee Name: _____ SS#: _____

Date of Screen: _____ Date of Injury: _____ Latency: _____months

A. Primary Body Part Injured:

0) Low back/Hip **1)** Neck **2)** Shoulder **3)** Hand/Wrist/Elbow **4)** Knee **5)** Ankle

Other/Comments: _____

_____

B. Secondary Body Part Injured:

0) Low back/Hip **1)** Neck **2)** Shoulder **3)** Hand/Wrist/Elbow **4)** Knee **5)** Ankle

Other/Comments: _____

_____

C. How Injured: 0 1 2 3

1) Vertical Injury- this would include lifting/transferring a patient or object from one point to another in the vertical plane. Not more then one step taken.
2) Horizontal Pull Injury-this would include pulling/rolling a patient or object in the horizontal plane, bringing them toward you.
3) Horizontal Push Injury- this would include pushing/rolling a patient or object in the horizontal plane away from you.
4) Carrying- this would include carrying a patient or object for a minimum of two steps.

Other/Comments: _____

D. Injured by what: 0) Patient 1) Object 2) Gurney/WC3) Other_____

E. Restricted Duty: 0) yes 1) no # of days restricted _____

F. Lost Time: 0) yes 1) no # of days lost _____

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EXPERIENCE

May 1994 to Present	ST. JOSEPH REGIONAL HEALTH CENTER, BRYAN, TEXAS *Director of Physical Therapy* Responsible for rehabilitation services in a 210 bed acute care hospital.
June 1991 to May 1994	REHABILITY CORPORATION, TEMPLE, TEXAS *Director of Physical Therapy* Responsible for developing, implementing, and marketing of Industrial Medicine programs.
January 1991 to June 1991	ASSOCIATED HEALTHFOCUS, SAN ANTONIO, TEXAS *Staff Physical Therapist*
August 1989 to December 1990	CHAMPIONS ATHLETIC CLUB, AUSTIN, TEXAS *Supervisor*
Summer 1989	ASSOCIATED HEALTHFOCUS, SAN ANTONIO, TEXAS *Physical Therapy Technician*
August 1987 to August 1988	JOHN LUCAS FITNESS SYSTEMS, HOUSTON, TEXAS *Exercise Physiologist*

EDUCATION

SOUTHWEST TEXAS STATE UNIVERSITY, SAN MARCOS, TEXAS
Bachelor of Science in physical therapy. December 1990.
**** GPA: 3.92 ****

TEXAS A&M UNIVERSITY, COLLEGE STATION, TEXAS
Bachelor of Science in physical education: exercise technology. May 1987.
**** GPA: Major 3.88 ****

GUEST LECTURING/TEACHING

- St. Joseph Regional Health Center, Bryan, Texas
  - Presentations to hospital and local businesses:
    Ergonomic Analysis