



Caregiver Ergonomics

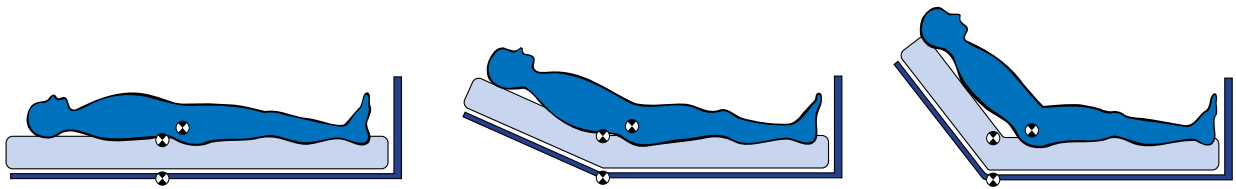
Patient Repositioning

Another difficult and time consuming task for caregivers to perform is the constant need to reposition the patient in bed. The volume of lifting, turning, pulling, and positioning of patients leads to fatigue, muscle strain and injury.

For years all beds have been built using a "Frame Pivot". "Frame Pivot" designed bed frames cause the patient to gravitate to the foot end of the bed as the head section is articulated. This results in the constant need to reposition the patient.

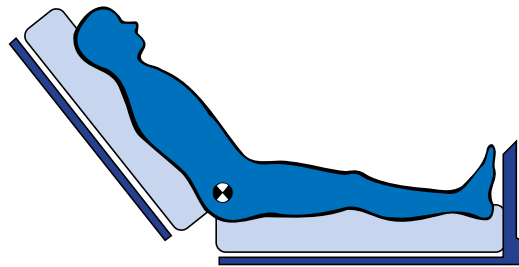
Because of the horizontal reach involved in gaining proper access to the patient and the weight of the patient, this task is very difficult and has been found to be a major source for occupational injuries. The combined effect of TotalCare™ System's Shearless Pivot feature and "FlexAfoot™" feature properly positions patients, minimizing the migration toward the foot end of the bed and reducing the need for patient repositioning.

Frame Pivot Design



On a Frame Pivot designed bed frame, as the head section is raised, the patient begins to migrate toward the foot end of the bed, resulting in the constant need for patient repositioning.

vs. Shearless Pivot Design



The Shearless Pivot design combines the articulation of the frame, the surface, and the patient in a fashion that minimizes patient migration towards the foot end of the bed, reducing the need for patient repositioning.



Shearless Pivot Patient Position

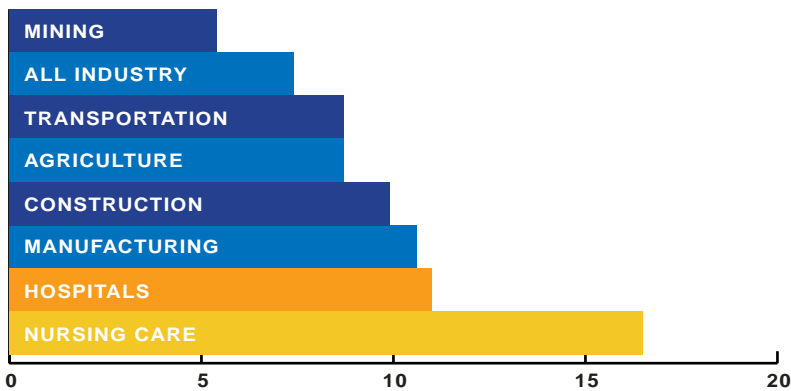


The unique frame design provides the flexibility to adjust the length of the bed up to 12 inches.

Occupational Injury Rates For Healthcare Workers

Figure 1

1996 COMPARISON OF OCCUPATIONAL INJURY INCIDENCE RATE BY INDUSTRY TYPE

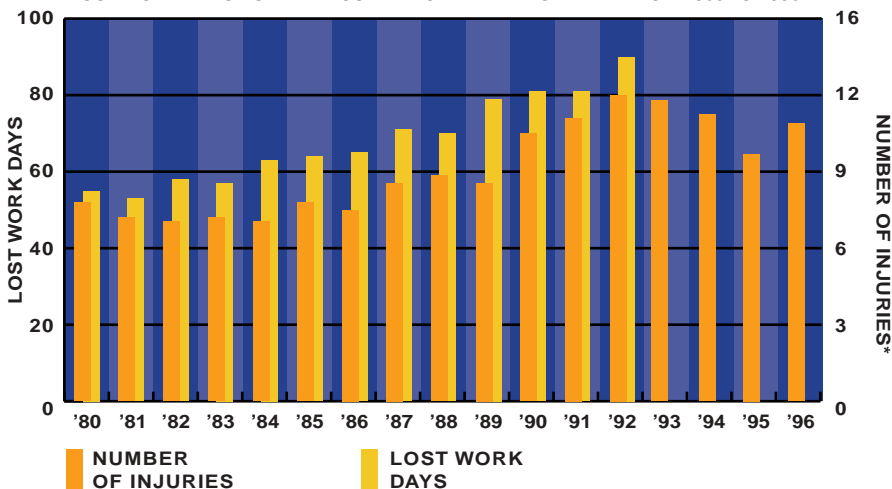


* Number of incidents per 100 full-time workers (assuming 40 hours per week, 50 weeks per year.)
Source: Bureau of Labor Statistics

The high cost associated with occupational disability continues to plague the healthcare industry. According to the Bureau of Labor Statistics, healthcare workers are among the highest when considering occupational injury rates (Figure 1). Over the past 18 years the healthcare industry has seen a dramatic increase in the occurrence of occupational injury resulting in staggering increases in lost work days (Figure 2). The number of work days lost due to job-related injuries has nearly doubled between 1980 and 1992. Within the acute care setting, a major part (72%) of the occupational injuries are associated with sprains/strains or other musculoskeletal disorders (Figure 3). Many of these injuries result from lifting, repositioning and transferring dependent patients. The body mechanics and the loads involved while accomplishing these tasks present extreme risk factors for caregivers to perform on a regular basis. It has been estimated that both the direct and indirect costs associated with occupational back disorders cost the healthcare industry in excess of \$5 billion per year.

Figure 2

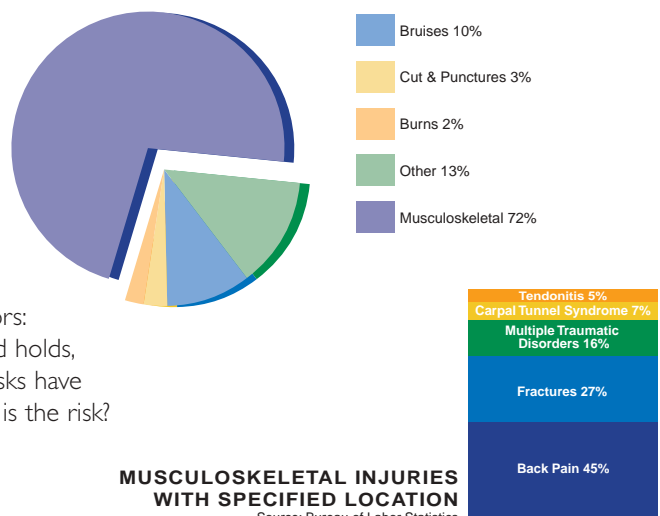
HISTORY OF OCCUPATIONAL INJURY INCIDENCE RATES AND ASSOCIATED LOST WORK DAYS FOR THE HOSPITAL CARE ENVIRONMENT FROM 1980 TO 1996



* Per 100 full-time workers (assuming 40 hours per week, 50 weeks per year).
** Bureau of Labor Statistics stopped recording lost work days in 1993.
Source: Bureau of Labor Statistics

Figure 3

TYPES OF HOSPITAL WORKER INJURIES January through December 1994



MUSCULOSKELETAL INJURIES WITH SPECIFIED LOCATION
Source: Bureau of Labor Statistics

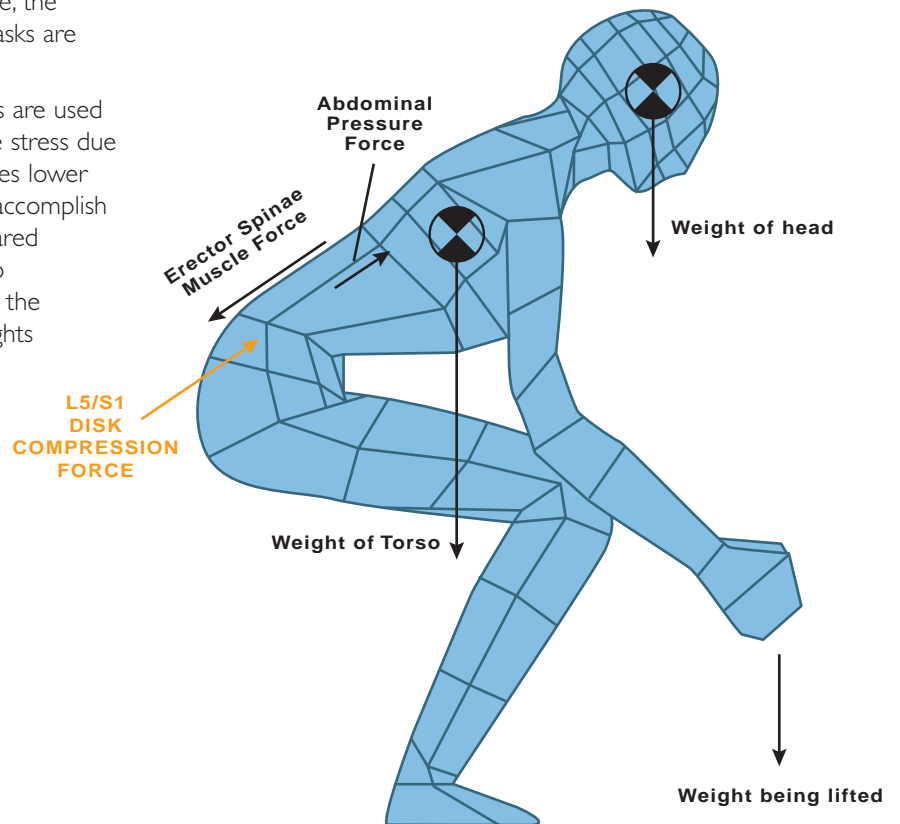
Risks of Patient Handling

The typical activities involved in the daily handling of patients contribute greatly to the risk of caregiver injury. These activities often include: reaching across the bed to access the patient, lifting the patient, lifting the patient to a chair, and lowering the patient to the chair. These activities often include many risk factors: reaching, sub-optimal lifting posture, carrying the load, poor hand holds, unstable load, awkward-sized load, etc. These patient handling tasks have been consistently considered high risk activities. But how severe is the risk?

Caregiver Activity Analysis Through Biomechanical Modeling

There are numerous ways to analyze worker activities for risk of injury. One such method is biomechanical modeling. Biomechanical modeling measures the positions and motions of the body, calculates the stresses on the body and compares these stresses to established design and maximum limits (see Figure 4). Using motion analysis systems and body kinematics software, the motions conducted during patient handling tasks are completely monitored and recorded.

The recorded motions, along with hand loads are used to create a model of the body to analyze the stress due to the specific task. This type of model analyzes lower back disk compression, strength required to accomplish the task for each joint, etc. This data is compared with strength capabilities of the population to determine the magnitude of risk of injury for the task. Using multiple patient and caregiver heights and weights, a better understanding of the complete risk of the activities for the whole caregiver population can be achieved.



Electronic sensors measure body positions and motions.



Motion and load are measured and analyzed to simulate the stress of a specific task.

Chair Positioning



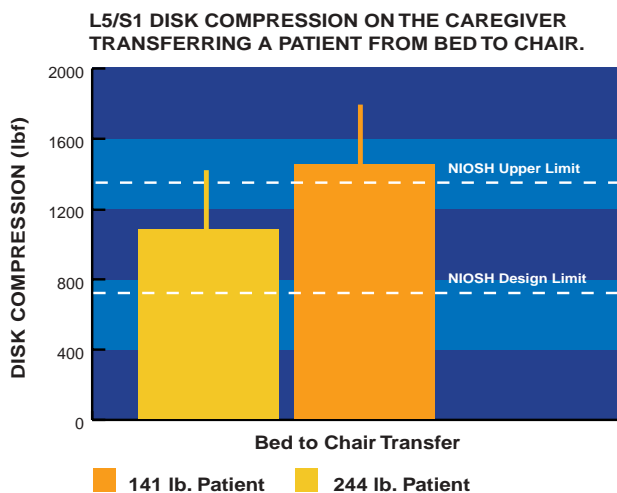
Chair Position



Chair Egress

Critical Pathways or Care Plans for many acute care patients include up-in-chair orders. While the frequency recommended by the physician will vary depending on a patient's condition, close to 70% of the up-in-chair orders written require that the patient be placed in a full chair position at least two times per day. In many situations, low compliance with these orders is common. Issues driving low compliance include staff availability, patient condition, patient comfort, as well as the difficulty associated with the transfer itself (e.g. line management, etc.). Using biomechanical modeling the musculoskeletal effects on the body caused by the work task (e.g. Bed-to-Chair Transfer) can be evaluated.

One of the most accepted measures of stress on the body is lower back disk compression. The results of this analysis can be used to compare different methods of accomplishing the task including comparisons to the design and upper limits specified by the National Institute for Occupational Safety and Health (NIOSH).



NIOSH has established maximum and design limits for L5/S1 lower back disk compression loading. These limits aid in the evaluation of worker tasks with respect to risk. Several other limits have also been established, such as strength requirements of each joint of the body, induced shear, etc.

Ergonomic Solutions

Traditional back injury prevention approaches—such as body mechanics training (where hospital workers are taught proper lifting techniques), physical fitness programs, training in the function and anatomy of the spine, etc. which focus on training the worker, continue to be the most common type of prevention activity. However, as we study the effectiveness of such approaches, leaders in this field continually question the impact these programs have on the prevention of occupational injuries. Alternate prevention strategies based on the principles of ergonomics, which identify high risk tasks and redesign the work place to eliminate such activities, are being relied upon more and more to reduce risks of worker injury.

Using biomechanical modeling, exertion rating, work-capacity evaluation, etc., ergonomics can be used to evaluate the tasks of patient handling and risks factors involved in worker injury. Ergonomic principles can then be used to redesign the job to fit the worker (not redesign the worker to fit the job), as well as, scientifically evaluate the reduction in risk factors due to interventions or new products.

References

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