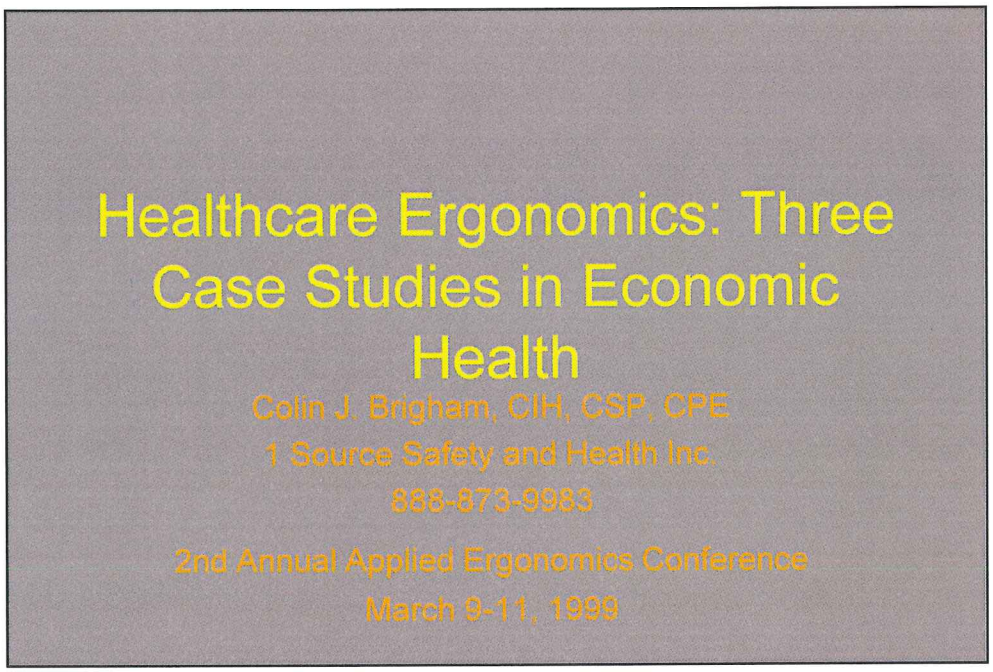
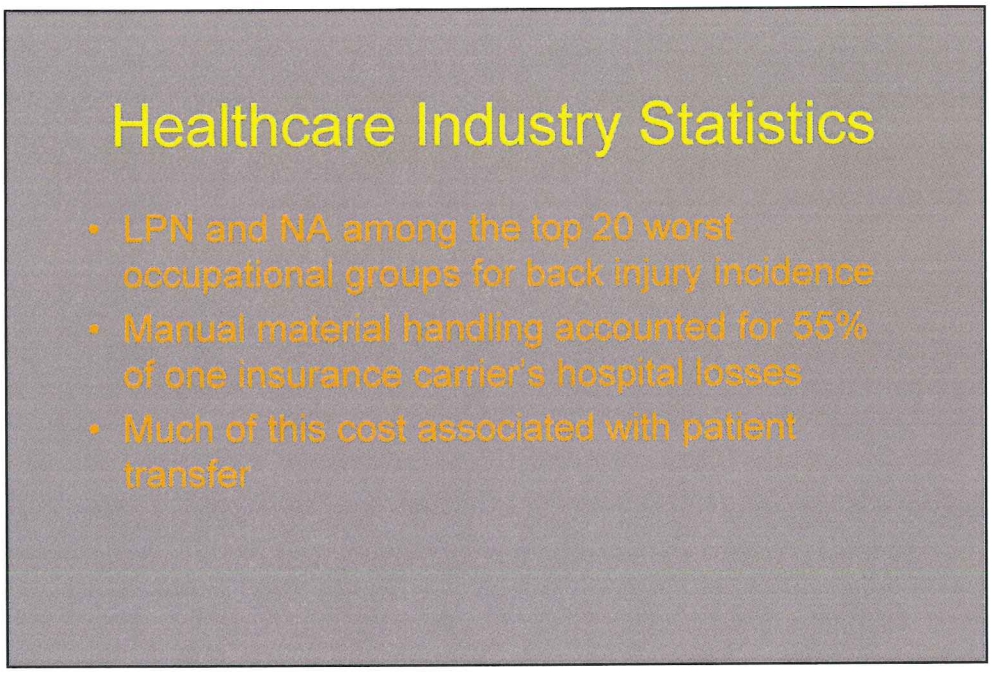


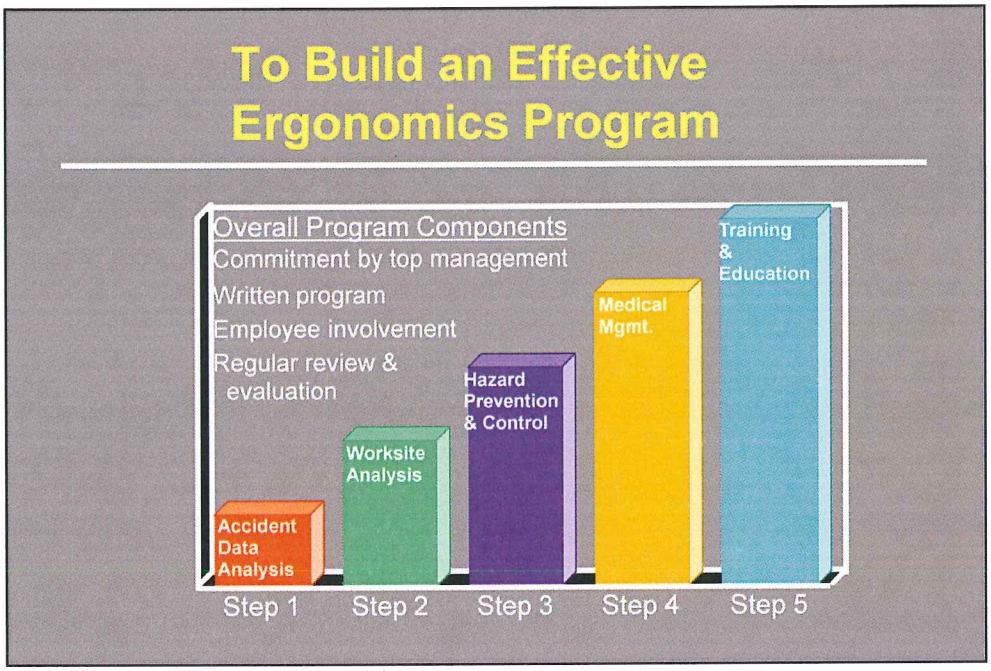
Good Afternoon! Today we will discuss the process used by three separate hospitals to recognize the presence and prevalence of work-related musculoskeletal disorders (WMSD), prioritize response to the problem areas found, and develop effective control methodologies. The effect of the ergonomic intervention undertaken will be presented, measured by indicators including:

- Reduction in physical demand
- Increasing the numbers of workers capable of performing the tasks
- Reducing OSHA lost workday incident rates (LWDIR)
- Reducing workers' compensation experience modification
- Reducing lost workdays per 100 full-time employees (LWD/100FTE)
- Reducing workers' compensation cost, and
- Achieving a high return-on-investment.



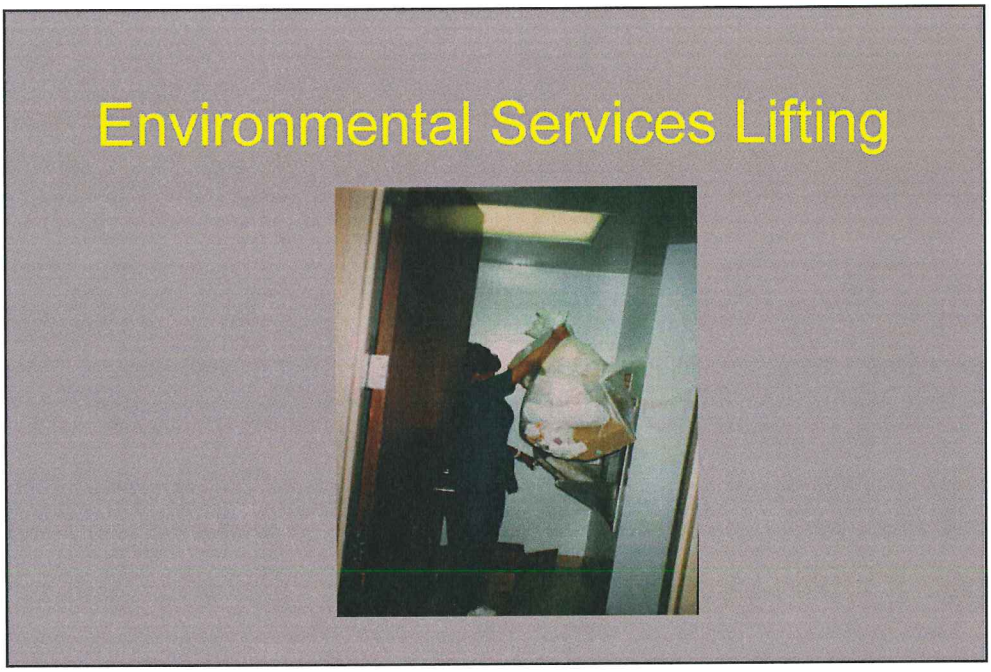
The healthcare industry and its primary foot soldier (i.e., the health care worker) have historically had the providing quality care to patients as their main focus. That is as it should be. However, this has often resulted in a failure to provide proper care to the health care worker (HCW), particularly as relates to work-related musculoskeletal disorders.

One effect of this failure is to have licensed practical nurses and nurses aides among the 20 occupational groups with the highest incidence of compensable back injuries. A study of one workers' compensation insurance carrier's experience for a four and one-half year period (from January 1, 1987 to June 26, 1991) revealed that 55% of their hospital insured's cost was due to manual material handling. The great majority of this cost was associated with patient transfer.



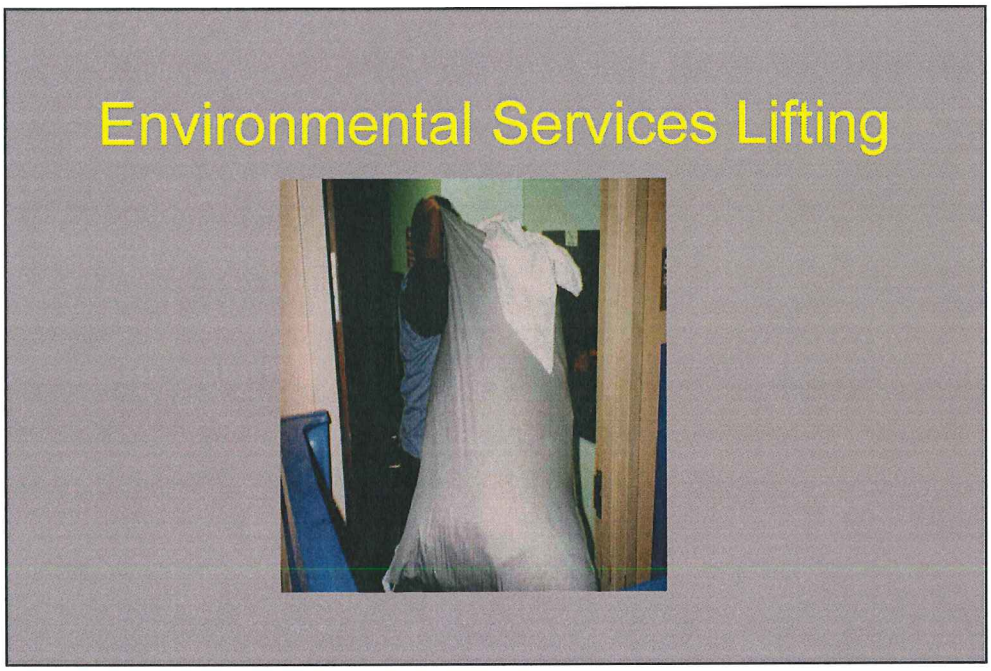
What has been effective in helping hospitals to reduce these costs? A five-step approach, which is shown in this figure, was applied at each of the three hospitals discussed in this presentation.

At the first hospital (a 230-bed facility), the approach began with discussions between the workers' compensation insurance carrier's ergonomist, the Director of Nursing, and the Director of Safety. All recognized, for different reasons, that a need existed. The process continued with an accident/incident data analysis being performed, with the two year period of 2/1/89-2/1/91 serving as the base line. This allowed the determination of presence and prevalence of WMSD.

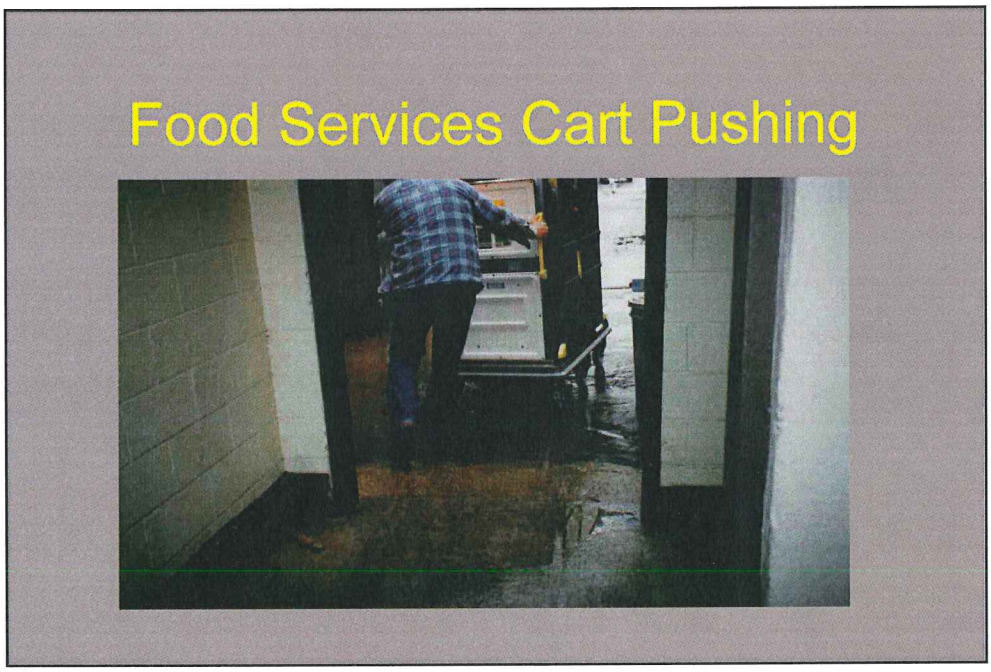


While patient handling was found to be the primary loss producing source, there were many other physically demanding tasks known to be potential problems. These included: medical records transcription, laundry, food services, laboratory microscopy, day care, facilities maintenance, and environmental services.

The environmental services worker shown here is attempting to open a chute that has a self-closing mechanism with one hand, raise the bag of waste with the other hand, and force it down the chute. Fire safety concerns require that the chute door be self-closing and not allowed to be secured open.



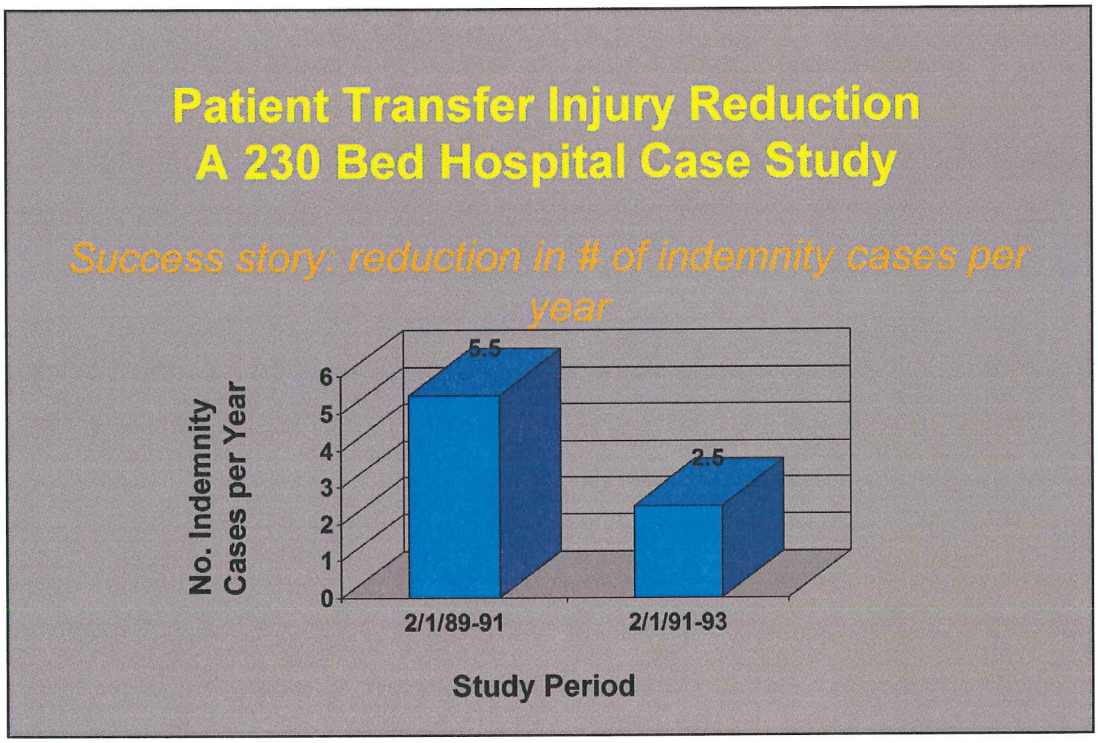
While the waste dumping in the chute is an awkward and demanding exposure, the dumping of laundry down an adjacent chute (as is shown here) is a much worse exposure. After considerable review, one change undertaken was to reduce bag size, thereby reducing weight.



The food service worker pictured here is pushing a heated and cooled cart that weighs about 765 pounds when fully loaded. It is used to transport meals from one kitchen to another and to other parts of the facility. The passage shown is through a doorway which has the potential to be wet, snow-covered, and uneven. Not shown is the ramp which leads up to the doorway. Pushing the cart up the ramp requires an average of 128 pound of force to be applied.

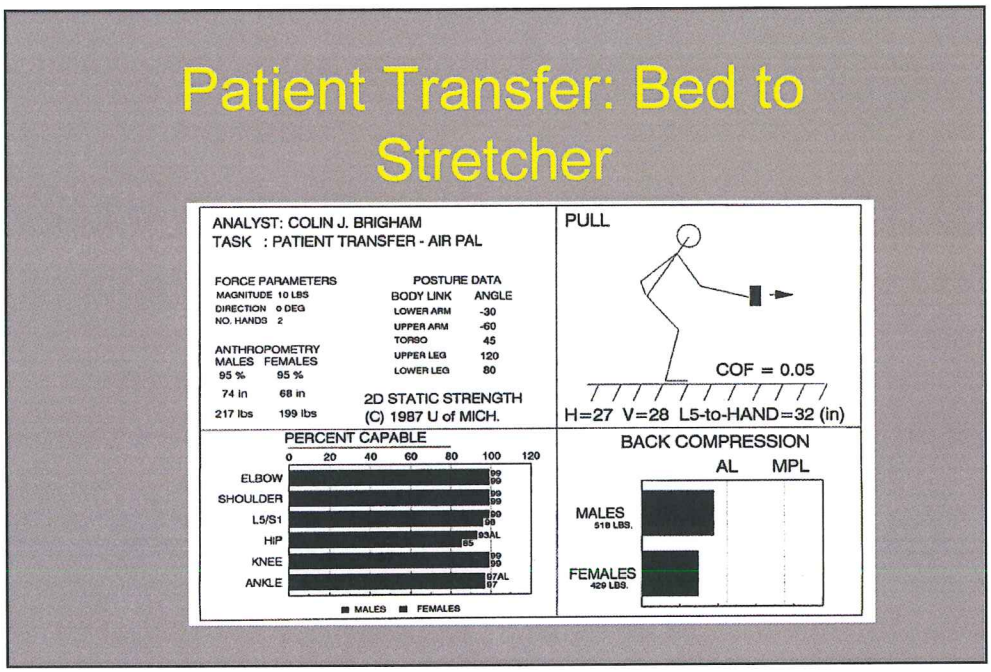
While these are significant hazards that were addressed, a review of the workplace injury and illness data revealed that the highest frequency and severity of incidents to staff at this hospital was associated with the horizontal transfer of patients - from bed to stretcher, stretcher to radiology

table, etc.



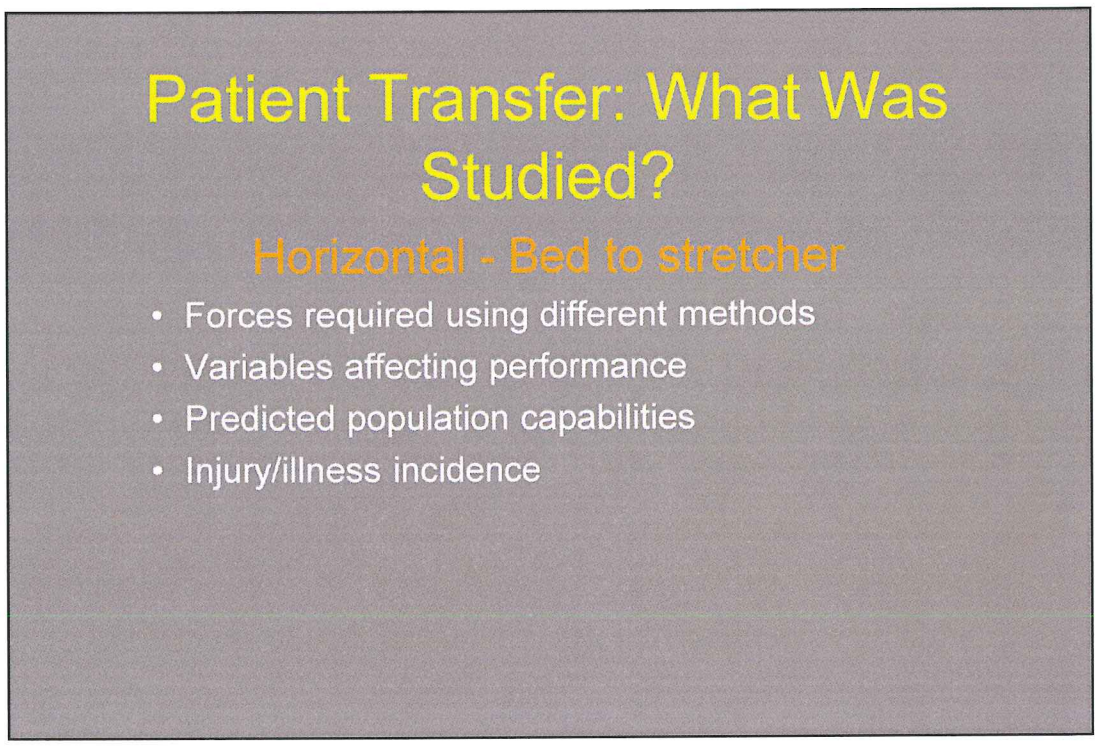
The indemnity (i.e, the lost time cases for which compensation was paid for wage loss) rate arising from patient transfer was 5.5 case per year prior to ergonomic intervention.

The impact on reducing indemnity (that is, workers' compensation lost time) cases is shown here.The cases occurring during the 2/91-93 period were due to transfers other than horizontal. There were no disabling incidents related to horizontal transfer after the introduction of these devices.



This resulted in a more thorough review of the work site, including the use of quantitative tools for reviewing physical demand, staff surveys, videotaping, interviews, and other efforts. The quantitative tools included the NIOSH lifting equation, psychophysical tables, and the 2D Static Strength Prediction Program from the University of Michigan. These tools were selected since they represented a mix of approaches (i.e., biomechanical, psychophysical, and mixed) were available, and were relatively easy to use and explain.

More quantitative review of some of the commonly used horizontal transfer approaches were then reviewed.



The first transfer studied was one commonly found to lead to injuries to health care workers, the transfer from bed to stretcher or stretcher to bed. (This is what you see in the show "E.R." where they say "ready, 1,2,3, lift.") This was selected after conducting surveys of HCW at several hospitals and receiving feedback identifying this as a high demand task. A review of injury and illness data at numerous hospitals confirmed this. The four factors studied were:

•The physical demands associated with each of 3 methods;

•The variables in task performance affecting demands and performance;

•The comparison of demands to models predicting worker capability to perform the task without injury; and

•The pre- and post-intervention injury/illness incidence

Patient Transfer: Bed to Stretcher Using Draw Sheet

207 pound patient

One person transfer

Chatillon Model CSD 300

137 pounds peak (ave.) measured, predicted 10% females capable 90 pounds

70 pounds sustained (ave.) measured, predicted 10% females capable 66 pounds

The first transfer studied involved the use of a draw sheet. This was the method of choice prior to the availability of devices. The draw sheet is used by turning the patient on one side, the sheet unfolded, the patient turned on the other side, and the sheet unfolded more. The sheet can then be grabbed by one or more HCW and used to pull the patient to the bed or stretcher. To achieve this, the HCW must reach across the bed or stretcher.

In this case, a one person transfer of a 207 pound patient was performed. In three tests, an average peak force of 137 pounds was measured. Psychophysical tables predict only 10% of females are capable of pulling 90 pounds in this position.

The average sustained force measured was 70 pounds. Psychophysical tables predict only 10% of females are capable of pulling 66 pounds in this way.

Patient Transfer: Bed to Stretcher Using Sliding Board

207 pound patient

One person transfer

Chatillon Model CSD 300

84 pounds peak (ave.) measured, 10% females 90 pound capable

52 pounds sustained average, 10% females 66 pounds capable

The second approach reviewed was the use of a sliding board. This device is a polypropylene board with hand holds cut out, being approximately 22"x72"x3/16" with corner cutouts. It provides a solid surface with a lower coefficient of friction than the draw sheet.

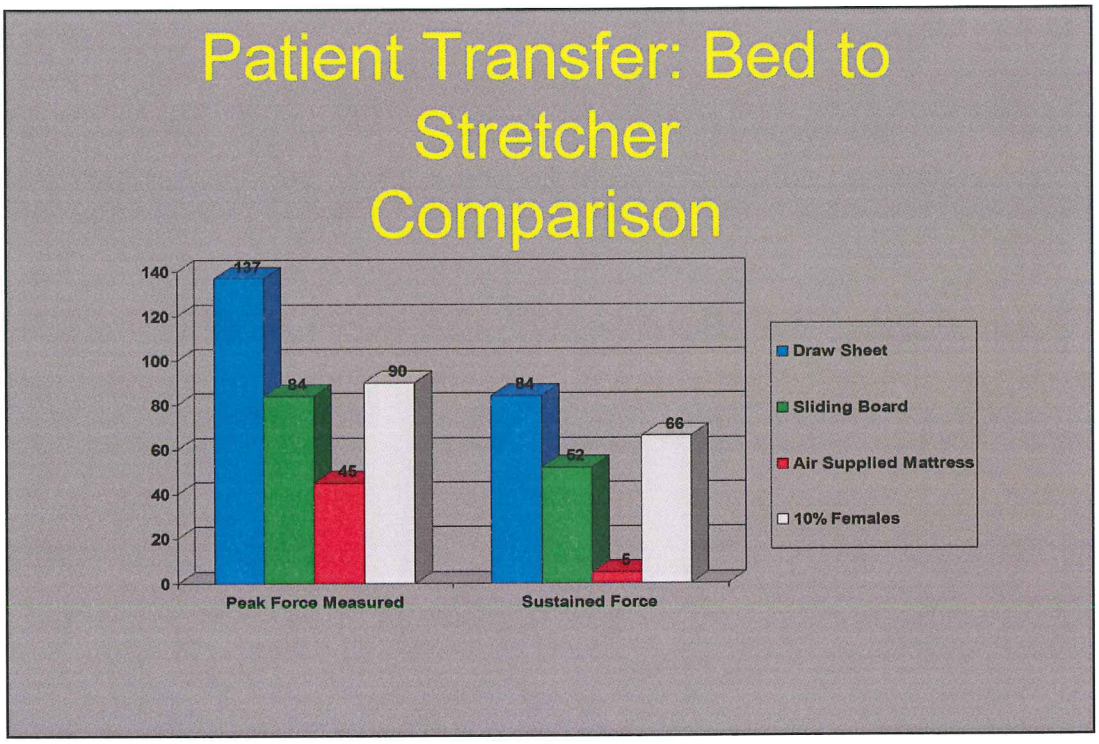
In three tests, an average peak force of 84 pounds was measured. Psychophysical tables predicted only 10% of females are capable of pulling 90 pounds in this manner.

The average sustained force required was 52 pounds. Psychophysical tables predicted 10% of females are capable of pulling 66 pounds in this manner.

The third device used was an air supplied mattress. It has about 4000 holes on the underside. It is inserted under the patient in a manner similar to the draw sheet, the patient strapped in, the mattress is hooked to a blower, and the transfer is made by pulling on straps. It's almost like air hockey with people.

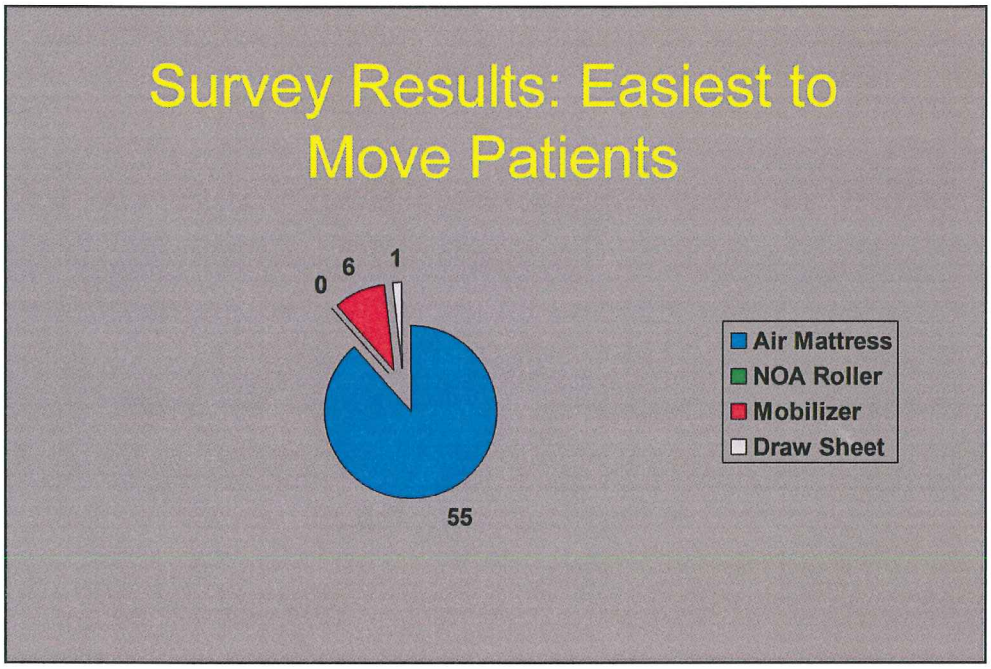
In three tests, the average peak force was 45 pounds. Psychophysical tables predicted 75% of females are capable of pulling 42 pounds in this manner.

The average sustained force was 5 pounds. Psychophysical tables predicted 90% of females are capable of pulling 33 pounds in this manner.



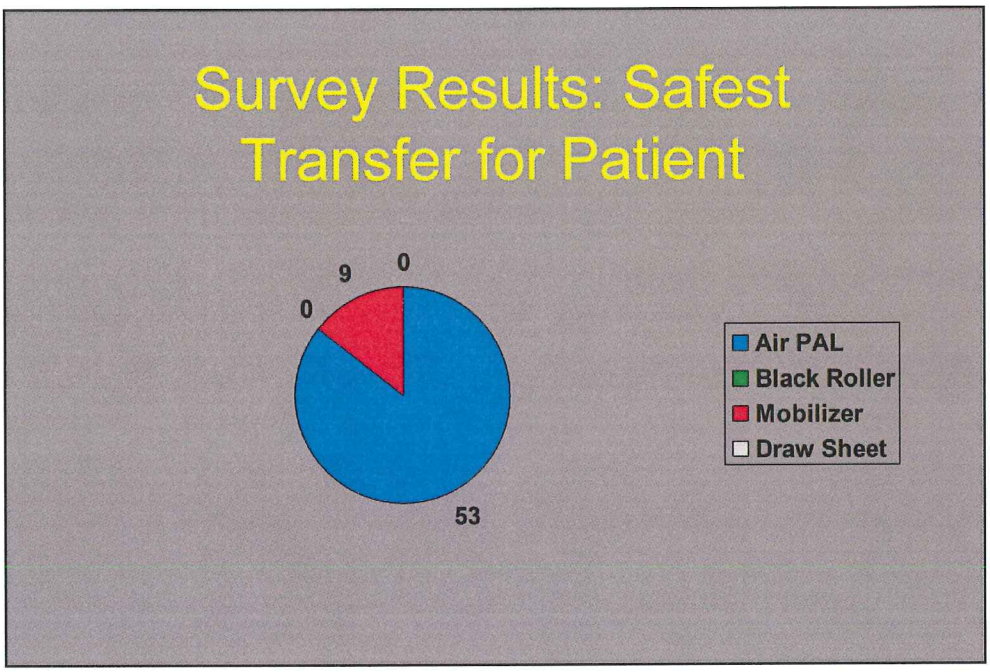
How do the results compare? In summary, the air supplied mattress required 67% less peak force and 93% less sustained force than the draw sheet. While less than 10% of females were predicted as being capable of performing the task with the draw sheet, approximately 75% were predicted capable using the air supplied mattress.

One way to prevent injury and increase the % predicted is to eliminate jerking to initiate movement, instead using a slow controlled pull.

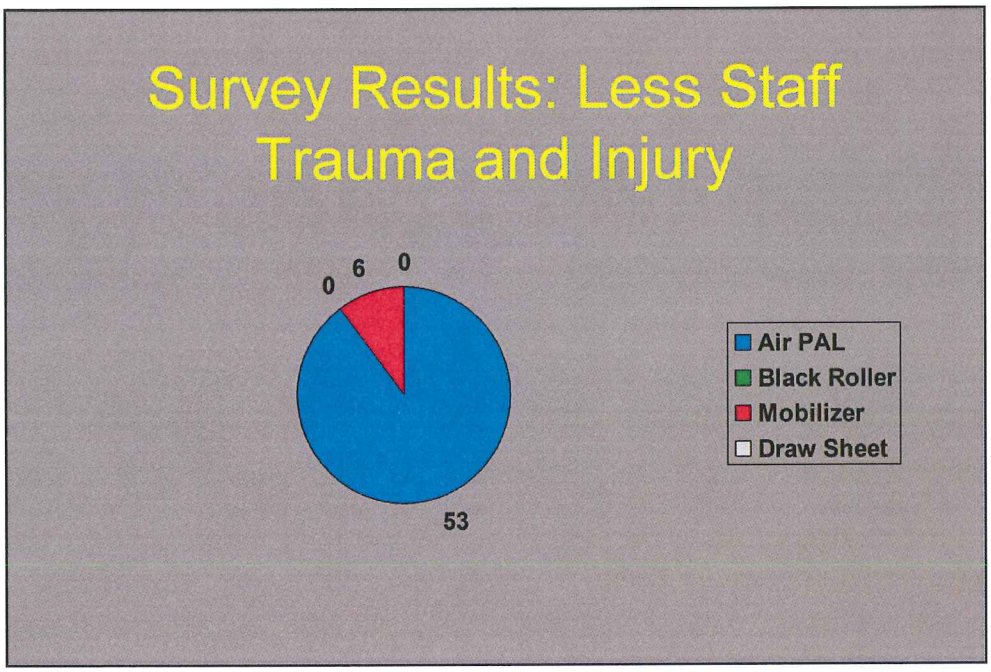


Following a trial use of the air supplied mattress at two hospitals, staff surveys were performed comparing the different approaches available for horizontal transfer. The Air PAL® is the brand name for the early version of the air supplied mattress, Hovermatt® is a newer version made by a different company. The Black Roller (i.e., Chick Patient Roller) consists of stainless steel and aluminum rollers covered with conductive vinyl. The Mobilizer® is a device that shuttles a transfer surface beneath the patient that then shuttles the patient onto the Mobilizer®. It is a wheeled device that also serves as a stretcher.

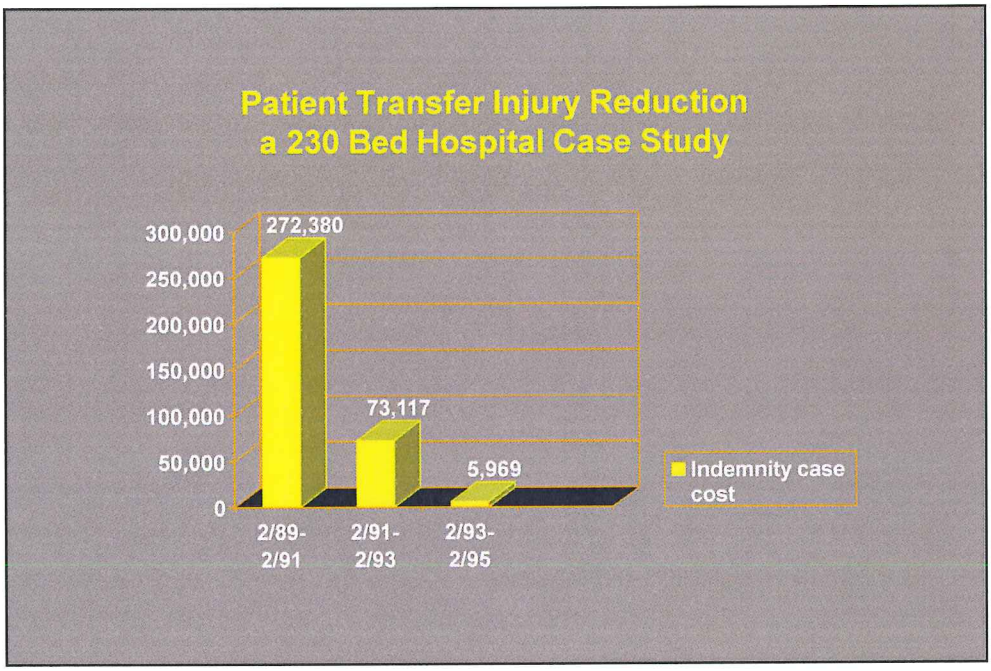
The first question asked was the ease of moving patients. 55 of the respondents gave the Air supplied mattress the highest rating, 6 the Mobilizer®, and one the draw sheet. No one rated the Black Roller the highest.



The second evaluation was for the safest transfer for the patient. 53 respondents rated the air supplied mattress the highest, 9 the Mobilizer®, and none the other approaches.

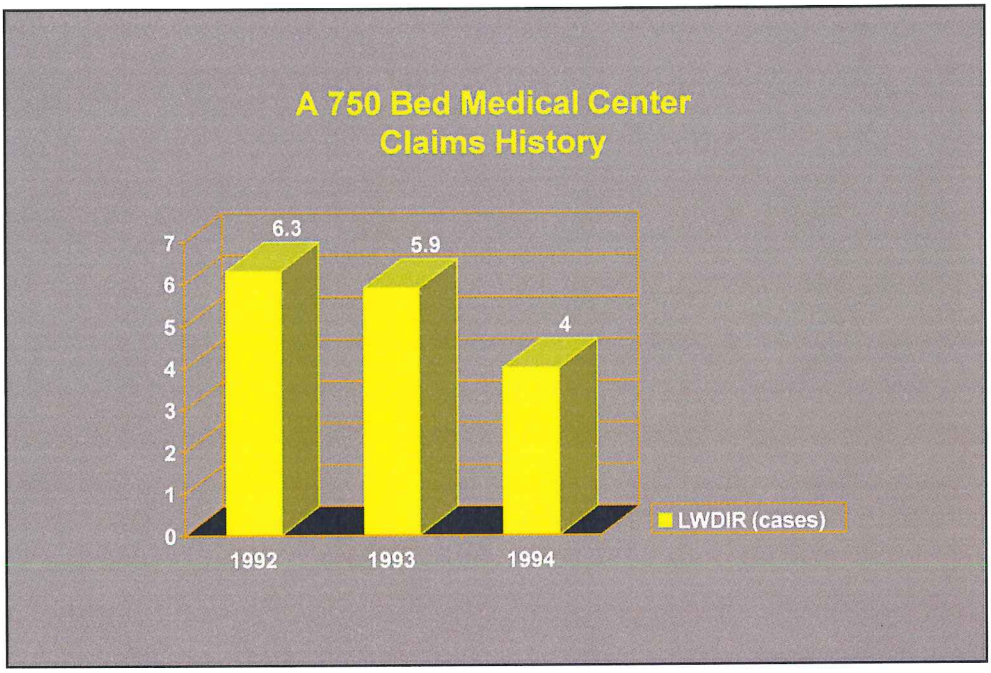


The third evaluation was for the approach likely to minimize staff trauma and injury. 53 respondents rated the air supplied mattress highest, 6 the Mobilizer® highest, and none the Black Roller or the draw sheet.



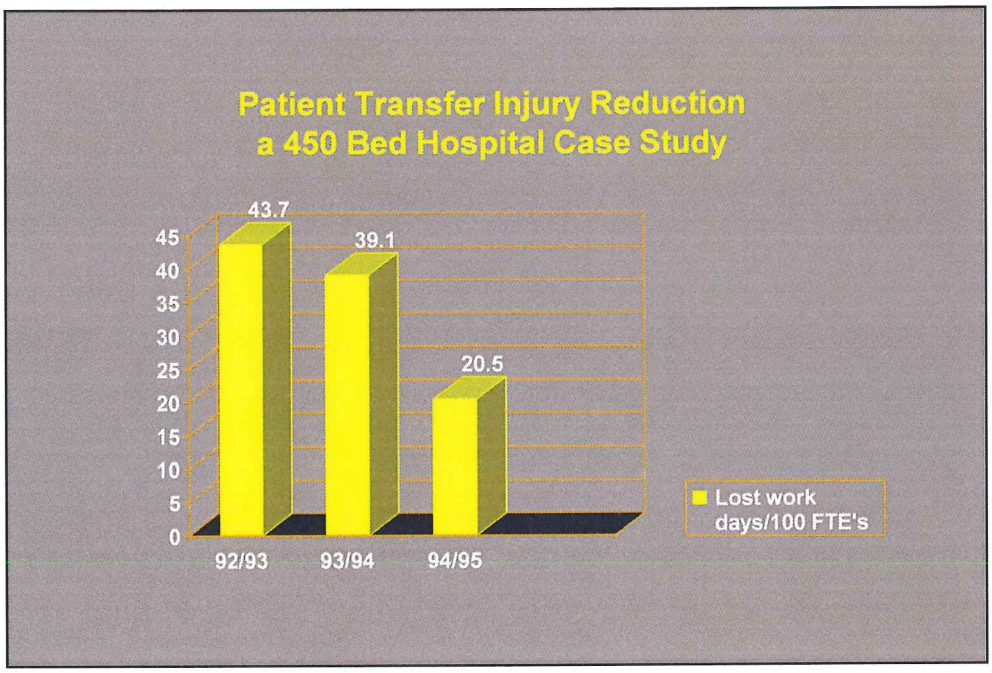
The result of these efforts was the plan to implement an ergonomic intervention program including the purchase of 13 Air supplied mattress (i.e., transfer technology) devices. These devices, which had been provided on loan for the purpose of the trial, were put into continuous use on February 1, 1991. The total cost of the devices was $22,000. The cost for patient transfer related incidents the two years prior to introduction was $272,380. The cost for the two years immediately following intervention was $73,117, a reduction of almost $200,000.

This is a second year return on investment of over 9.0. None of the patient transfer injuries during the 2/91-93 period were horizontal transfers of the type addressed by this intervention.



A second case study involves a 750-bed medical center. Another way to measure success is to demonstrate impact on reducing the OSHA lost work day incident rates (LWDIR), as is shown in Figure 6.This hospital had a LWDIR significantly higher than industry average. It recognized that a major reason was the prevalence of work related musculoskeletal disorders. A comprehensive ergonomics program using the 5-step approach was implemented. One component of their program was the implementation of an ergonomics team with representation from each of the major departments.

This team was provided with a 30-hour, facility-specific, ergonomics training workshop in late 1993. The typical exposures that are of concern at hospitals were presented, the incident experience at their facility was reviewed, and problem solving done. The work site analyses that had been performed to date were reviewed. They were taught the use of some of the tools available for the analysis of physical demands, including the three mentioned previously. These efforts were a large part of the reason for the reduction in LWDIR from 5.9 to 4.0 for calendar year 1993 to 1994. Their LWDIR continued to improve, reaching 3.3 in 1997. This compares to an industry average for hospitals in 1997 of 4.1. They went from significantly worse than industry average to significantly better.

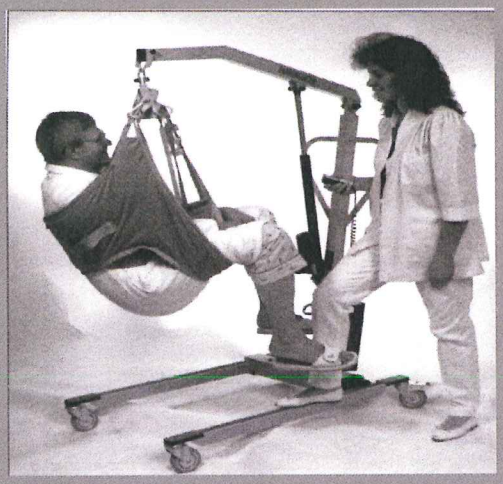


A third hospital applied the five-step approach, again recognizing that patient transfer was the primary loss-producing source that needed to be addressed. One measure of performance is the number of lost work days per 100 full-time equivalent employees. Prior to the implementation of the ergonomic changes their rate was 43.7, as is shown in Figure 7.

Horizontal transfer of patients was the first problem area addressed as the accident data analysis identified this as the primary loss producing source measured in terms of both frequency and severity. Again, the Air Pal® was selected as the device to use, with its successor, the Hovermatt®, now being used.

These efforts resulted in a reduction in lost work days per 100 full-time equivalent employees (FTE) from 43.7 in policy year 92/93 to 20.5 in policy year 94/95. Staffing is always a critical issue at hospitals. This kind of effort provides dramatic staffing availability improvement.

Patient Transfer: Personal Lift (Total)



207 pound patient

Chatillon Model CSD 300

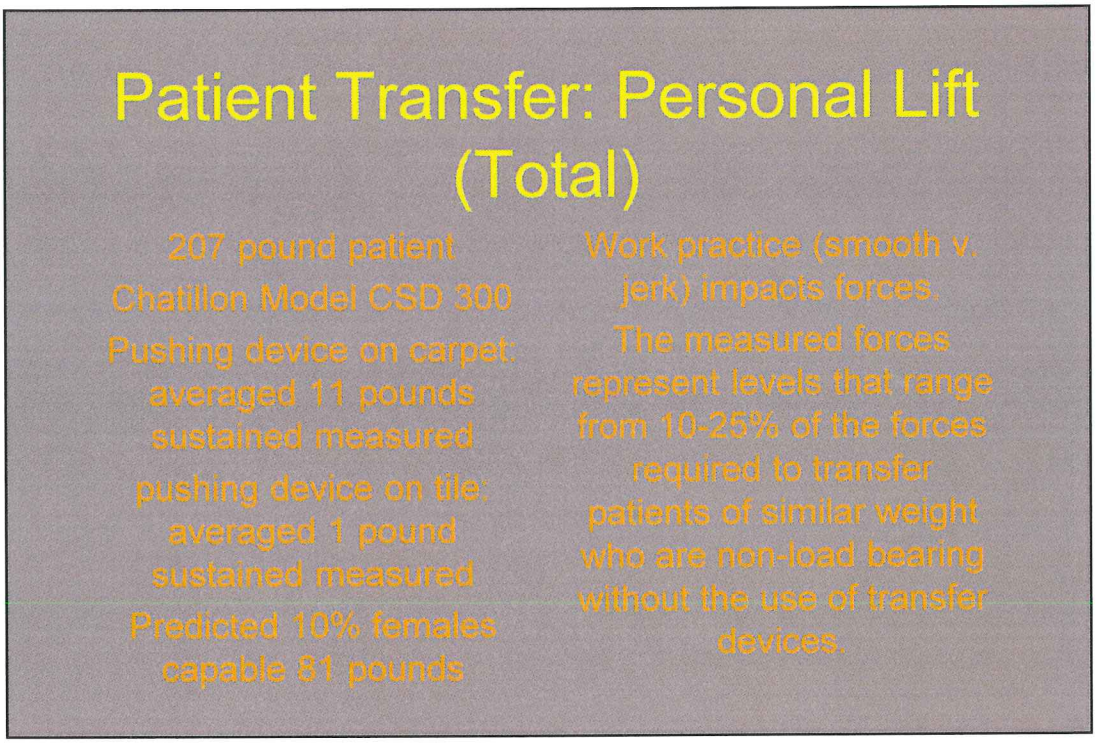
Pushing device on carpet: up to 45 pounds peak measured

Pushing device on tile: up to 23 pounds peak measured

Predicted 10% females capable 108 pounds

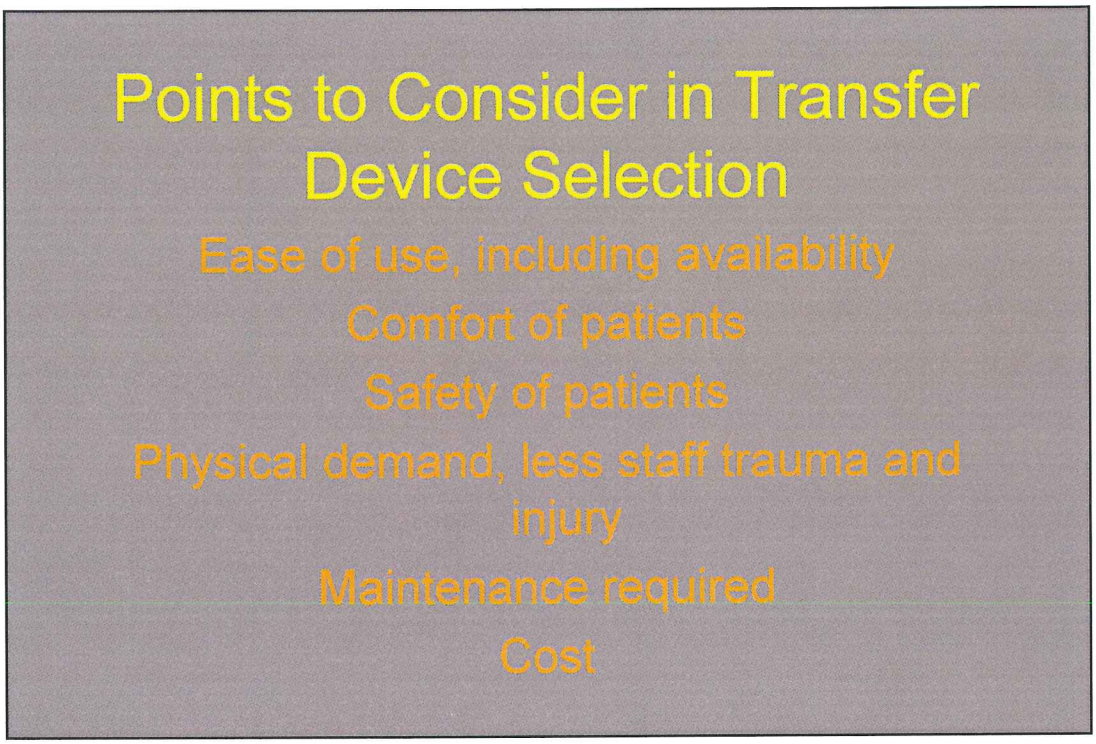
The use of devices for performing total lifts, such as the one shown here, can be helpful in reducing the physical demand for transfers from bed to chair, floor to bed, floor to chair, and others. One of the concerns with these devices, which often come equipped with power lifts but not power push/pull, are the forces required with pushing/pulling.

In three tests with the device shown, up to 45 pounds peak pushing force was required on carpet and up to 23 pounds on tile. Psychophysical tables predict over 90% of females would be capable of performing this task in this manner.



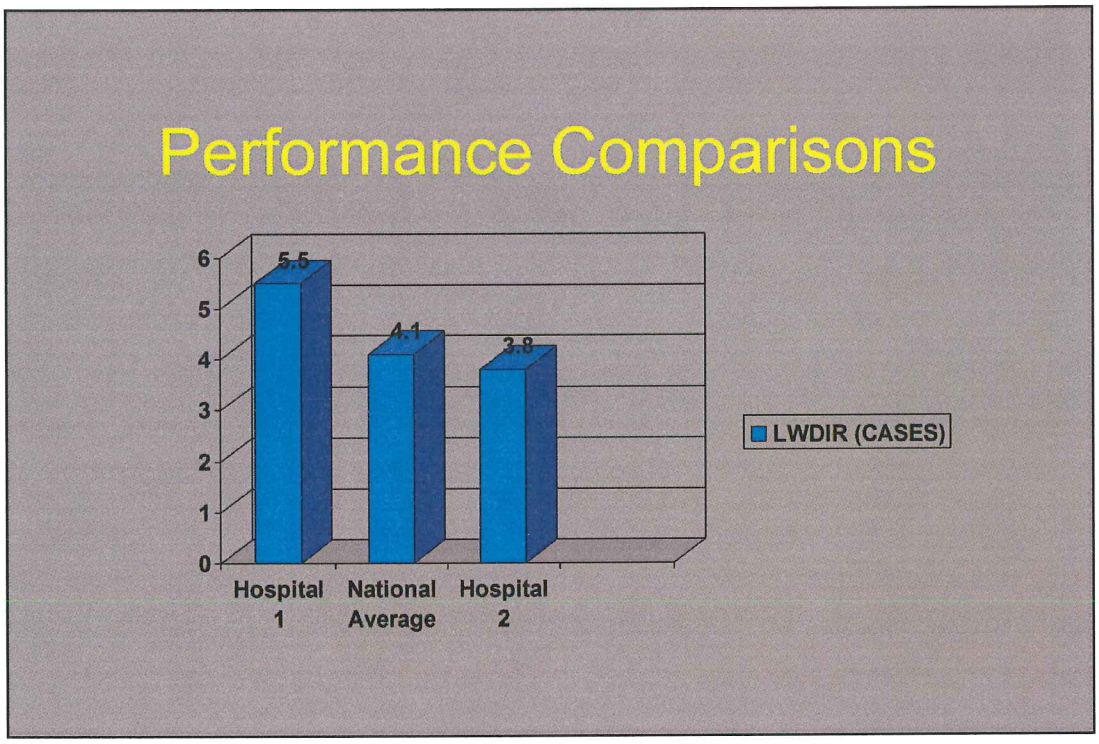
Carpeting does increase the pushing force required, with the force on carpets measured averaging 11 pounds, the force on tile 1 pound. Physcophysical tables predict 10% of females are capable of pushing 81 pounds, 90% are capable of pushing 59 pounds.

Some work practices that impact forces are proper initial orientation of casters and using smooth motions instead of abrupt.



There are several manufacturers of patient transfer devices offering a variety of features. Some of the points to consider in transfer device selection are;

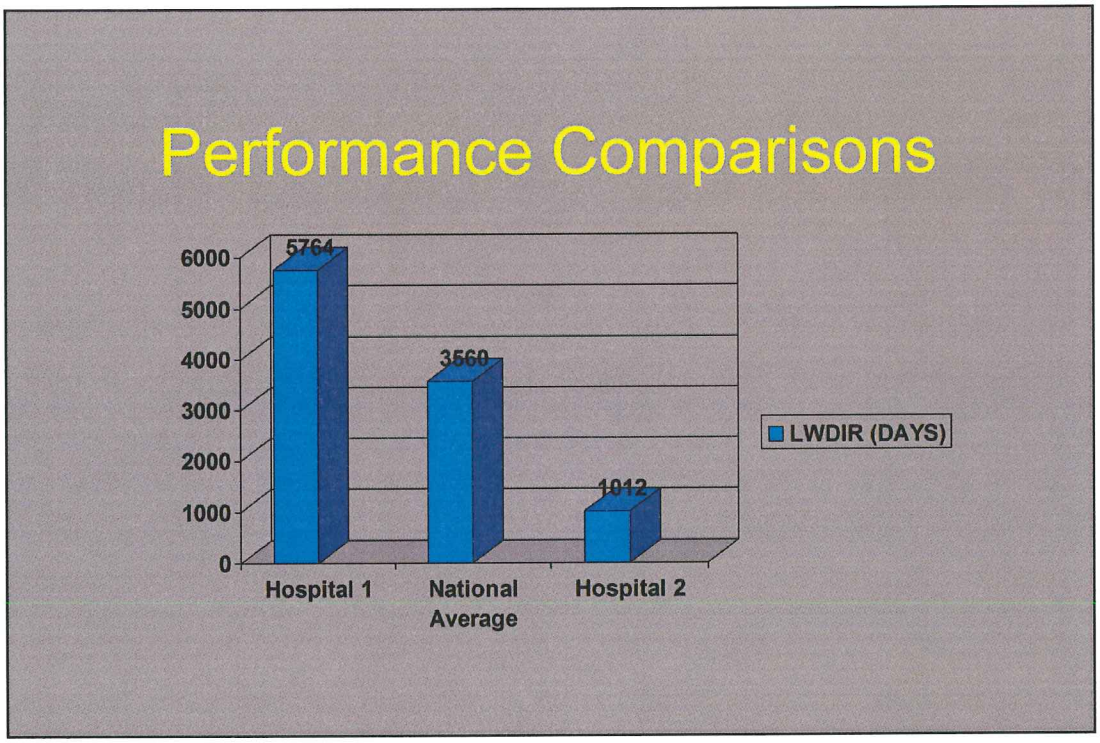
- Ease of use, including availability (easy to use, store, charge, etc.)
- Comfort of patients (ease of insertion, for example Gait belt versus Ergonomic Walking Belts)
- Safety of patients (stability of the devices was a problem with some of the early models)
- Physical demand, less staff trauma and injury (powered versus hand-cranked or pumped devices)
- Maintenance required (durability, parts availability, complexity)
- Cost (both long and short term)



How much of a difference can an effective safety ergonomics program make? In this slide and the next two you will see the performance comparisons between two hospitals of about the same size (about 750 beds and 5,000 employees each) and comparison to the national average rates for hospitals. Hospital 2 has had an effective program in place for several years. Hospital 1 had just begun initiating an effective program at the time these statistics were generated.

This slide shows the lost workday incidence rate for the number of cases (LWDIR - cases) for each of the hospitals and hospitals across the nation. Hospital 1 had 5.5 out of 100 employees with lost work day cases, hospital 2 had 3.8 out of 100 employees with lost workday cases.

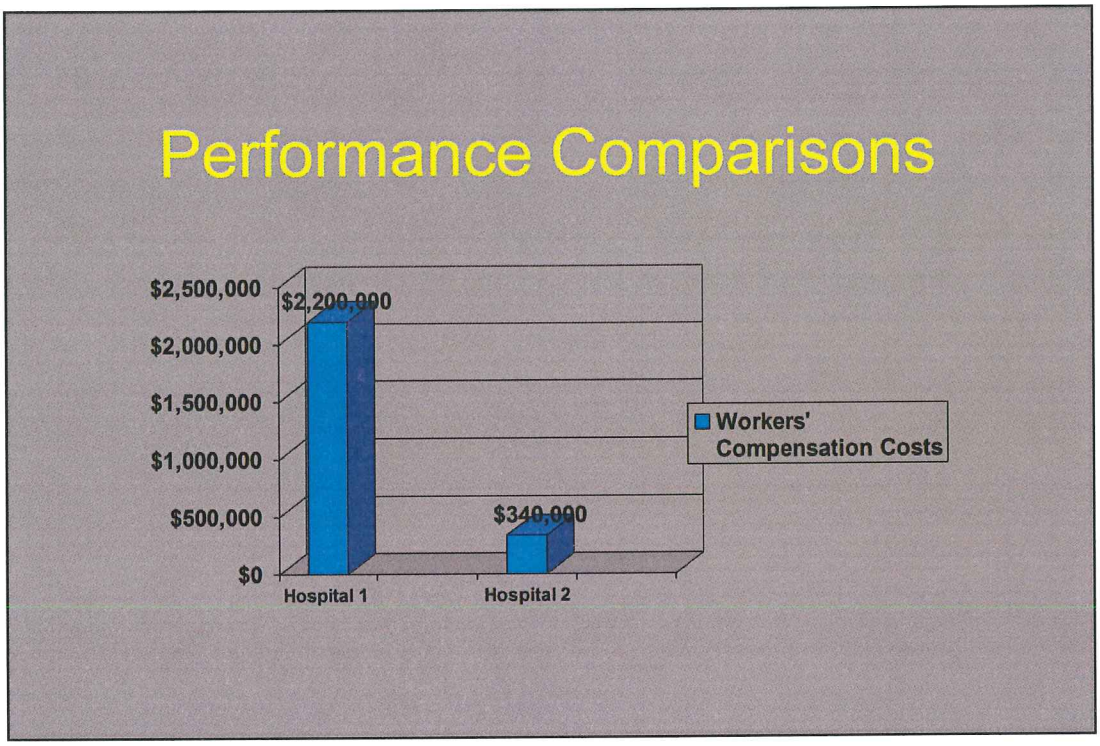
The national average for hospitals was 4.1. Comparison against the national average, historical performance, and other hospitals are methods of benchmarking.



A second performance comparison involves looking at the number of lost workdays. Hospital 1 had over 5 times as many days lost due to work-related injuries and illnesses (5764 versus 1012). What costs, other than workers' compensation, are incurred when you have employees out of work? Some of the hidden costs include:

* recruitment
* training
* reduced productivity
* interruption of servicing capability
* reduced value of service

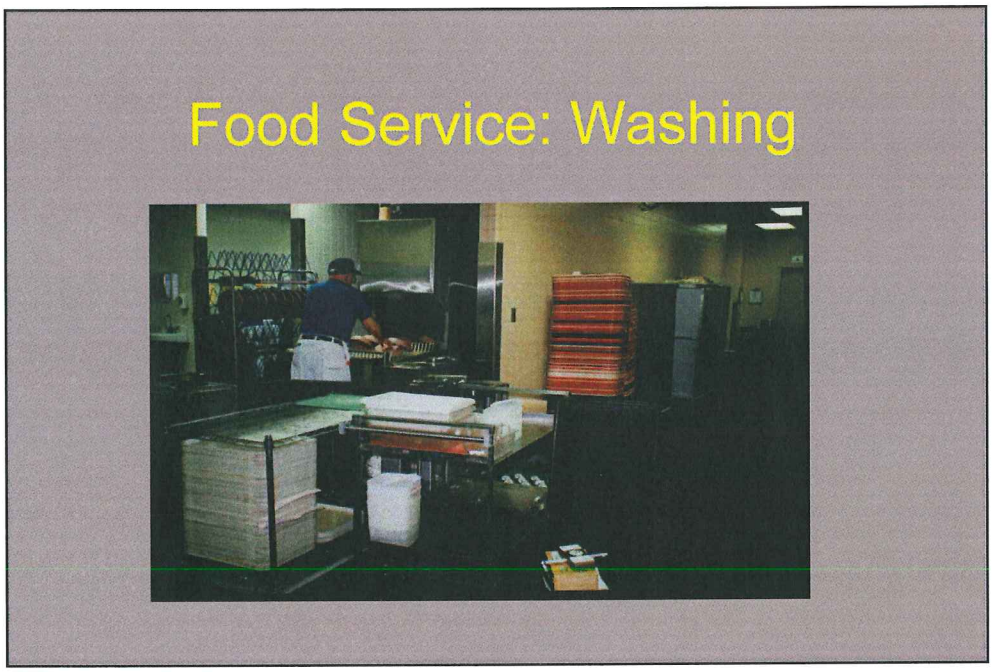
A current focus of hospitals is "improving the environment of care." At which facility would you rather receive care?



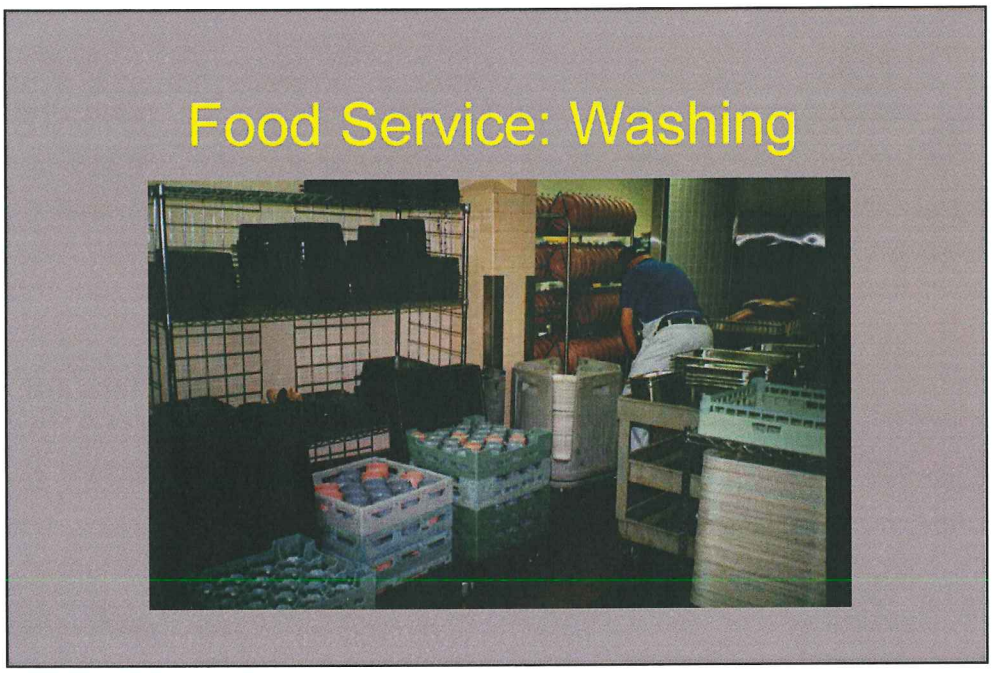
The third performance comparison between these hospitals shows the resultant impact on workers' compensation costs. Hospital 1 had seven times the cost of hospital 2. At which hospital do you think top management would be more inclined to provide monetary compensation for a job well done?

These are real case studies. Hospital 2 has had a comprehensive and continuously improving program in place for several years. Prior to that their losses were almost as bad as those of Hospital 2.

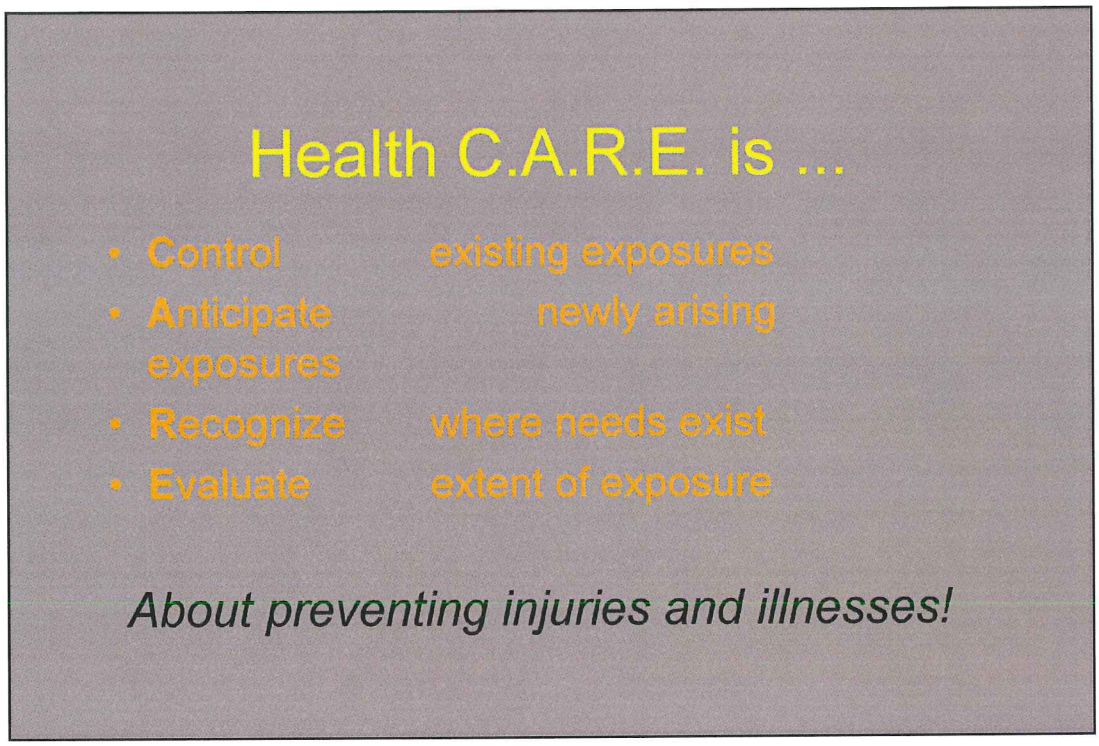
The foundation of this and most successful programs is an ergonomics management accountability plan (we use the acronym "MAP") that is based upon performing a needs analysis. The application of this type of approach has now helped Hospital 1 to achieve over a 40% reduction in their # of lost work days and lost work day incidence rate since the comparison shown in these three slides was made.Effective management works!



Another exposure with high physical demand and potentially awkward postures is dishwashing. The employee at the end of the line here has a great many different types of objects that may be coming to him through the washer. He has to pick and place these to any of a number of different stacks.



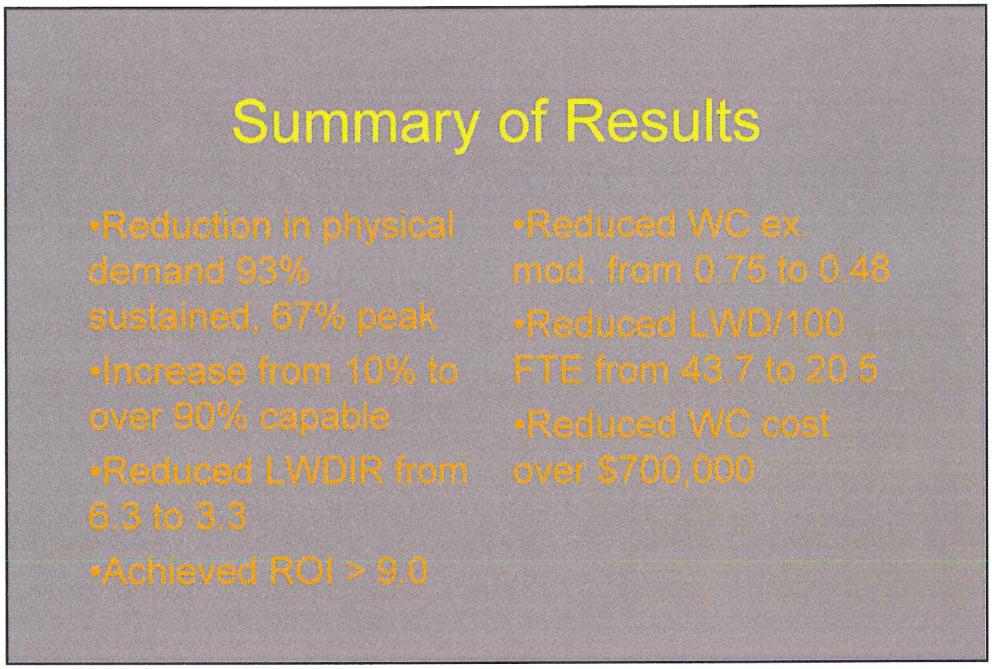
Note the bending posture that must be assumed here and some of the travel distance required.



The process of reducing injuries and illnesses, including work-related musculoskeletal disorders, in hospitals can be explained by using the acronym C.A.R.E. It begins with making certain that existing controls that are in place to prevent harm from exposures are working effectively. It requires the anticipation of newly arising exposures by process and equipment review prior to its use. It includes the use of periodic review systems to recognize where needs exist. And lastly, it requires the use of evaluation tools to determine the extent of exposure.

While the focus in hospitals has historically been to provide quality patient care, the recent patient transfer equipment and method innovations help

improve care of the health care worker. After all, healthcare is about preventing injuries and illnesses!



In summary, the results achieved by the hospitals involved in these efforts include:

•The reduction in physical demand for horizontal patient transfer (i.e., from bed to stretcher) of 93% in sustained forces and 67% in peak forces

•Increasing the % capable predicted for this transfer from 10% to over 90%

•Reducing LWDIR case rate for injuries and illnesses from 6.3 to 3.3

•Reducing WC ex. mod. From 0.75 to 0.48

•Reducing LWD/100 FTE from 43.7 to 20.5

•Reducing WC cost over $700,000

•Achieving a return-on-investment of over 9.0.

Any Questions? Thank You!