



Interface

a common boundary between systems,
equipment, concepts, and human beings

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INTRODUCTION Walt Rostykus, Ergonomics Branch

Welcome to the latest issue of *Interface*. This issue provides a range of topics within the discipline of occupational ergonomics, including wellness, integrating ergonomics in product design, observations on "common sense ergonomics" and effective safe patient handling programs. We tried to compile a variety of articles that offer something to every reader.

We can always use your help in writing newsletter articles. Anyone is welcome to submit articles. What are some of your experiences in ergonomics? What is working for you? What is not working so well? We want to hear from you! Please submit your article to hank@saunwired.net, jeremy.chingoharris@ge.com or wrostykus@humantech.com.

How Ergonomics Plays a Role in Our Long-Term Initiatives for Wellness

Now this is a catchy title. Do you realize you spend much more time at work than you do at home? Most people spend a minimum of 40 hours per week, 5 days per week doing something job-related. Even working from home can be long, arduous and can really take a toll on our bodies and minds.

Wellness is defined as:

- The condition of good physical and mental health, especially when maintained by proper diet, exercise and habits
- The quality or state of being healthy in body and mind, especially as the result of deliberate effort
- An approach to healthcare that emphasizes preventing illness and prolonging life, as opposed to emphasizing treating diseases

Ergonomics is defined as the science of fitting the job to the employee. When there is a mismatch between the physical requirements of the job and the physical capabilities of employees, work-related musculoskeletal disorders (WMSDs) can result. These disorders are also known as cumulative trauma disorders (CTDs) and can affect all aspects of life.

Employees who repeat the same motions throughout their workday (repetitions), work in stressful environments (personal risk factors), work in awkward postures and have jobs that require forceful lifting, reaching, bending, carrying and holding heavy objects are all at risk for an ergonomic injury during their working lifetime. The problem arises when these injuries to our body parts, such as:

- Back
- Neck
- Shoulder
- Elbow
- Wrist/finger
- Knee
- Lower leg
- Feet

The injuries become chronic. They affect our way of life, our ability to relate to our coworkers, family and friends and our ability for movement in general.

Job stress is now a recognized problem in our working environments. Current research from University College London (UCL) links job stress strongly to heart disease. Published in the *European Heart Journal*, the research is the first large-scale study to look at the cardiovascular mechanisms of work stress in the population. According to a UCL news release, the findings provide the strongest evidence yet of the way job stress can lead to coronary heart disease.

A company cannot have a successful wellness program if the jobs are too stressful both physically and mentally. All of the incentives from a behavioral perspective will not work if the load is too heavy, the workstation is not set up properly, the lighting is poor, the tools and equipment are problematic or the working relations are contentious and combative.



How Ergonomics Plays a Role In Our Long-Term Initiatives for Wellness (cont.)

When ergonomics is applied to job designs, tools, equipment and the work methodology, the risks of WMSDs are diminished and employees are more content and able to perform with greater productivity.

A good wellness/ergonomics process within any company will reduce absenteeism, reduce workers' compensation claims, increase productivity and quality and generally be the answer to meeting management goals. We are an aging working population, and we want to control our destiny and retire in good health so we can all "go fishin'" when and where we want.

ErgoARTICLE Jeff Sanford, CPE, Managing Consultant, Humantech

Building Ergonomics into the Product Design Process

Validating that a product is designed with solid ergonomic attributes can be completed at various steps of the product development lifecycle. Efficiencies are seen when these reviews are completed earlier in the process, but keep in mind that a product can be approved as "ergonomic" at any step. The fact that a product provides an ergonomic advantage for the end user is important for various reasons: marketing, our aging population and because the customer will like using the product. Ease of use is a key factor in customer satisfaction.

There are three general stages in a product design lifecycle when ergonomic design principles can be introduced. Below is a quick description of those stages along with key activities required to ensure that ergonomic design criteria are included.

1. Pre-Design. This creative phase is really generating the concept for the product. Modeling or sketches will be created with definition of function being the main goal of this phase.

Key Activities: Designers must be aware of or trained in ergonomic design principles. Without this knowledge, the design will be what the team *thinks* is right, and that type of vague approach will not result in a solid design from an ergonomics perspective.

2. Design Gate Reviews. In most design processes, "gates" are passed through as the product design is finalized. The gate review process confirms that every aspect of the product is designed according to plan and allows for an iterative design process.

Key Activities: This is a go or no-go process and typically is governed by a subject matter expert in ergonomic design principles and/or human factors design. Integrating ergonomics during this phase allows the subject matter expert to provide input at appropriate phases in the launch process. The designs will be tested using methods like objective measurement of the efforts to use the product, fatigue analysis and end-user testing. If the product has been designed in accordance with accepted ergonomic design guidelines, the design passes through the gate. If not, the design team will reevaluate the design.

3. Post-Design. Once a product has been approved for build and the design is frozen, there is still an opportunity to validate the product's design.

Key Activities: This requires a product review to determine if the design meets ergonomic principles and is in accordance with accepted ergonomic design guidelines. The designs will be tested using the methods mentioned above. The outcome of this review is a statement defining which aspects of the product are within



Building Ergonomics into the Product Design Process (cont.)

guidelines and which aspects need improvement. These improvements can either be implemented immediately, if feasible, or they can be integrated into the next generation of the product.

Making unfounded claims that a product is ergonomic is quite common, and unfortunately hurts the credibility of the field. This happens because no unified design standard exists against which to compare a product's attributes. However, industry-accepted guidelines, when implemented, will improve a product's usability. In summary, examine your current resources and determine the best method to validate your product as ergonomic—it can provide the competitive advantage everyone is looking for in today's economic landscape.

ErgoARTICLE Chitaranjan "Jivan" Saran, Ph.D., P.E., CPE, CHCM, UCMO

Common Sense Ergonomics

Ergonomics derives from two Greek words, Ergo (work) and Nomos (norms or laws). Ergonomics is a technique to optimize efficient, safe and healthful performance. Ergonomics was first introduced into scientific literature by Polish educator/scientist Wojciech Jastrzebowski in 1840. It is a common sense approach to ergonomics, which our grandmothers tried to inculcate in us—"excesses are bad." Repetitive exposures to excessive stresses without proper training or rest may result in lifting challenges, hyper- and hypothermia, hearing loss, cumulative traumas and carpal tunnel syndromes.

Ergonomics improves productivity, safety and health and the quality of life. It also depends on one's psychosocial and physical environments. It is essential that the internal bodily environment be in harmony with the external environment. Disharmony between the two environments leads to stress, which leads to errors. Errors lead to accidental injuries and diseases. The two environments are functions of one's culture and genetic makeup. It is difficult for short people to succeed in basketball. Cultures, which produce short people, will have difficulty in the game.

The motto of the 1880 Chicago World's Fair was machines perform, men conform. Human adaptability, in many cases, makes them perform tasks inefficiently. Tasks performed harmoniously will be much more productive, less fatiguing, healthy and environmentally friendly. Any stress causing temporary discomfort is capable of causing permanent damage. Careful attention to a work-rest-work regimen is essential for efficient and safe performance. The regimen's rest phase must be long enough to help the body recuperate fully from the effects of work. The appropriate duration of this phase is a function of the individual's physical and psychosocial health and work environment. A person coming home may too tired to perform household chores but has no problem golfing with his buddies.

For optimal human–environment interaction, designers must design the environment to suit the individual. Operators are generally the best resource to help the designers. Many of them improvise gadgets to reduce the stress. We just need to observe and listen to them. The next obvious choice may be to limit the duration, frequency and severity of exposure. The least preferred alternative may be to design the individual to suit the task through training, exercises, selection and motivation. In many cases, a combination of the three may be justifiable.

Understanding the 10 Commandments of Ergonomics will demystify ergonomics and will improve productivity and efficiency in a safe, healthful and environmentally friendly manner.



Common Sense Ergonomics (cont.)

The 10 Commandments of Ergonomics are:

1. K.I.S.S.
2. Evolution.
3. Fetal Position.
4. Psychosocial Environment.
5. Physical Environment.
6. Adjustability.
7. Work-Rest Regimen.
8. Biped and Falls.
9. Task Variation.
10. Abduction/Torsion.

Keeping it simple removes the fear of the uncommon term “ergonomics.” From a biomechanical perspective, the evolutionary process of conversion from quadruped to bipeds made humans unstable and increased the possibilities of falls. One is most stable in a fetal position in a mother’s womb. It is least stressful as the psychosocial environment and the external bodily environment within the womb are in harmony. Human adjustability and adaptability contrary to basic biomechanics create stress. Many objects of our physical environment assume human adaptability. Earlier automobiles, chairs and work stations are classical examples of one size fits all. A work-rest regimen should allow the rest period to recuperate from the stresses of the work period. Task variation (mental/physical) should help recuperation. Tasks involving rotation of torso around the lower spine cause physical stress. Body parts away from the center of gravity of the body, e.g., extended arms or legs without support, increase stress on the body.

I was on panel of 10 national experts invited to assess the economic and technological impact of OSHA's proposed ergonomic standard. There is talk of revisiting OSHA's ergonomics standards. With across-the-board budget cuts, it will be difficult to enforce the standard. Ergonomics guidelines may be a better way to go than standards.

In conclusion, demystifying ergonomics and communicating it to the general public in a common sense approach would make it more acceptable to the public.

ErgoARTICLE Jason Schaufenbuel, MPH, CSP, United Heartland

A Model Safe Patient Handling Program: Details & Results

According to the Bureau of Labor Statistics, nursing aides, orderlies and attendants have the highest rate of injuries and illnesses due to musculoskeletal disorders of all occupations (http://www.bls.gov/iif/oshwc/osh/os/osh06_37.pdf). At a rate of 293 cases per 10,000 workers, they lead even laborers and material movers at 158 cases/10,000 workers. What generally drives these injuries is the significant amount of physical activities nurses and nursing assistants perform on a daily basis. Tuohy-Main estimates that the cumulative weight a nurse lifts in a day is approximately 1.8 tons (http://www.tuohy-main-systems.com.au/manual_lifting.html). The problem is so significant that the American Nurses Association reported that 52% of nurses report chronic back pain and 12% of nurses leaving the field report back pain as the main contributing factor.



Model Safe Patient Handling Program (cont.)

In 2002, United Heartland, a monoline workers' compensation carrier operating primarily in the midwest and southeastern U.S., began to see significant loss trends in its nursing home accounts. Claims frequency and severity were driven by the following incidents:

- Resident/Patient Transfer
- Slips/Falls—Same Level
- Resident/Patient Assisting

With back injury costs driving losses, the organization decided to combat the loss trend by evaluating methods to assist insureds in reducing the primary source of back claims—injuries associated with resident/patient transfer and assisting.

In researching the injuries associated with transfer and assisting residents, the organization realized that a comprehensive safe patient handling (SPH) program, following the elements put forth by the Veterans Affairs Veterans Integrated Service Network 8 Patient Safety Center of Inquiry as well as OSHA through its *Guidelines for Nursing Homes: Ergonomics for the Prevention of Musculoskeletal Disorders* (http://www.osha.gov/ergonomics/guidelines/nursinghome/final_nh_guidelines.pdf) with some modifications, should successfully reduce the frequency and severity of claims.

Program Elements

Ultimately, United Heartland decided on a comprehensive SPH program focused on the following elements:

Written Program

A written program was deemed necessary for organizations to document their SPH practices and to communicate a consistent message to their employees. The policy must address all resident transfers and transfer devices, which include gait/walking belts, total body lifts, sit-to-stand devices and lateral transfer devices. In addition, the policy must address management's commitment, responsibility and accountability for the program and the handling of special circumstances, such as bariatric transfers, combative residents and residents who have fallen. The final part of the written program must document the organization's practices related to the five remaining program elements.

Objective Transfer Criteria

In our practice, we have found that a primary key to the effectiveness of a SPH program is staff's ability to assess the transfer needs of the residents under their responsibility to ensure that the proper transfer process is used. The means that nursing homes use to assess the transfer needs of their residents vary, ranging from having a third party, such as a physician or contract physical therapist, to a staff member conduct baseline and ongoing transfer assessments. One problem with this situation is that a resident's ability to assist with transfers/repositioning can be affected by factors, such as fatigue, medications or short-term changes in their medical condition. Such conditions may be present for such limited durations that a formal transfer needs assessment cannot be performed in a timely fashion.

Given the limitations of the traditional transfer needs assessments, nursing homes must establish objective transfer criteria that staff can use to assess residents prior to each transfer. United Heartland's minimum suggestion is that organizations adopt time limits to determine transfer needs. For example, residents who can be freestanding more than four seconds could be effectively transferred via a walking belt. Residents who can stand for four or less seconds with some assistance could likely be transferred via a sit-to-stand device. Those residents who are unable to stand with limited assistance for any time period would require a full body transfer



Model Safe Patient Handling Program (cont.)

device. The time limits are meant to be minimums, and many insureds have increased the time limits to 15 or more seconds.

The intent of having objective transfer criteria is not to have staff circumvent the transfer requirements established via the formal assessment process. At a minimum, staff must follow the formal transfer requirements but be allowed to use transfer means that are more protective should the resident's condition dictate. A common example is at the end of the day. Consider a resident whose formal transfer needs assessment was conducted in the morning, found to be borderline sit to stand/total body lift and is assigned a sit-to-stand transfer to encourage continued mobility. By the end of the day, after the resident has engaged in a day's activities, they may be moderately exhausted to the point that they no longer are able to use a sit-to-stand transfer device. In this case, the staff would recognize the change in the resident's condition and be permitted to use a total body lift as it is more protective of the resident's safety.

Within the past year, the author observed an ingenious alternative objective transfer assessment process in a hospital, which should be suitable for most nursing homes. The criteria, which the hospital is unsure who developed, are as follows:

- Not able to stand up from seated 3 times or stand in one place for 30 seconds—total body lift
- Able to do above but not march in place 6 steps at bedside—sit/stand device
- Able to stand and march but not able to take step forward and back with each foot—sit/stand device or wheelchair
- Able to do all of the above but with difficulty understanding and following directions—gait belt
- If able to complete all of the above, considered independent.

Quality Assurance

With any safety and health endeavor, it is critical that management take steps to ensure that the program is used as envisioned. With SPH, this is no different and management must be proactive to ensure that employees transfer residents in accordance with the program. Supervisors must conduct regular unannounced observations of staff transferring residents. One observation quarterly per staff member would be a minimum. In addition, other quality assurance elements include:

- Completing thorough evaluations of any transfer-related injuries or incidents to ensure that proper practices were followed during the transfer event.
- Continually monitoring resident transfer needs and comparing that to available equipment.
- At least annually evaluate the overall effectiveness of the program and the program elements.

Initial & Ongoing Education & Training

Employee training is key to a successful program; as such, an organization must establish a process to ensure that employees are trained on proper transfer practices prior to performing resident transfers. This often means training staff on SPH transfer practices as part of orientation, as standard industry competencies will likely not be appropriate for the equipment and practices the organization has adopted.

Training practices must also be established for ongoing training, post-incident retraining and training for staff who have been off work for an extended period of time. All training sessions should be hands-on and should require employees to demonstrate their competency on all transfer equipment they will be expected to use.



Model Safe Patient Handling Program (cont.)

At a minimum, training topics should include:

- Use of mechanical lifts
- Use of lateral transfer devices
- Repositioning residents
- Preuse visual inspection requirements of transfer equipment
- An explanation of the objective transfer criteria and how it is to be used

Progressive Disciplinary Program

Occasionally, employees may deviate significantly from expected practices, and the organization will need to ensure that they have procedures in place to address such situations. Ideally, the organization will already have a disciplinary program in place through which non-conformance with the SPH program can be addressed. Otherwise, the organization will need to implement a progressive disciplinary program to address non-conformance.

Equipment Inspection & Maintenance

Ensuring that the transfer equipment used as part of the SPH program is properly maintained is critical for resident safety and permits employees to use the equipment when they need it. Given this, the organization must ensure that equipment is inspected and maintained at a minimum frequency consistent with the manufacturer's requirements or at least monthly. Such inspections should be documented.

Prior to staff performing a transfer, they should complete a visual inspection of the equipment to ensure that it is safe for its intended use. Such inspection need not be documented; however, employees need to be trained on what they should specifically look for.

Implementation

United Heartland developed the model SPH program in 2004 and trained its loss control staff on the program's elements and how to assist insureds with implementation of the SPH program.

A key part of the implementation process consisted of professional development of the loss control staff on issues related to SPH, initially and on an ongoing basis. The intent of the staff development is to enable them to speak to the administrators and directors of nursing homes in their own language to help them better understand the model SPH program and how implementation assists them in creating stronger, safer and more profitable organizations.

Specific loss control staff development activities include:

- Extensive hands-on training on the use of transfer equipment (gait belts, mechanical transfer devices, lateral transfer devices), including demonstrations by various vendors on their equipment
- In-depth training on the specifics of the model program
- Discussions and training on overcoming objectives, how to gain management and employee buy-in
- Resident-specific issues, such as transfers involving bariatric, combative and residents with dementia
- Training on common transfer algorithms
- Participation in the Annual Safe Patient Handling & Movement Conference sponsored by the Department of Veterans affairs and the University of South Florida

In addition to staff development, client-use materials were created and provided to insureds to assist them in adopting and strengthening their SPH programs. Client use materials included:



Model Safe Patient Handling Program (cont.)

- A document reviewing the model SPH program elements
- Suggestions for overcoming objections to SPH programs
- SPH program implementation guide/checklist
- The standard roles and responsibilities under a SPH program
- Forms to assist in resident transfer need assessment
- Forms to assess transfer equipment needs
- Staff observation/competency assessment forms
- Transfer equipment and sling inspection forms
- Suggestions on the use of lateral transfer devices and a directory of such devices
- Review of gait and walking belts
- A one- and two-person gait-belt transfer training DVD

Initially, loss control staff reviewed the model program with nursing home accounts and then worked with them to develop plans to fully implement the SPH program. As with any program, some accounts quickly adopted the program while others took a more cautious approach or refused to implement the program. The cursory results of the program were so successful that all nursing home accounts below a minimum premium threshold were required to implement the SPH program or risk being non-renewed.

In addition to having the loss control staff educate nursing home management on SPH principles, the loss control staff takes personal responsibility to assist the nursing homes they are responsible for in all aspects of the program's implementation. Such services include assisting with the mapping of resident transfer needs, evaluating transfer equipment needs against equipment inventory, providing in-service training, conducting transfer observations and acting as a technical resource to safety and patient care committees on best SPH practices. The objective of the loss control staff is not to implement the program for the nursing homes but to guide them as needed and to routinely review their progress.

SPH Program Results

While the initial results of the SPH program appeared to be leading to a reduction in claims, United Heartland decided to undertake a formal study of its insureds' performance in late 2008. The study evaluated the claim/loss performance of nursing home accounts by comparing their performance for the two years prior to the SPH program mandate against the two most recently completed years following the mandate. For most accounts, this meant that their performance in policy years 2002 and 2003 was compared to their performance in policy years 2006 and 2007. All nursing home accounts that met the criteria were included in the study. This resulted in 57 nursing homes being included in the study. Most of the accounts in the study had implemented a SPH program; however, a few accounts were ultimately non-renewed because of non-compliance with the program mandate. It is believed that this study population would represent the broad base of nursing home accounts the organization writes, as they have various levels of SPH programs implemented at the time of policy endorsement.

Statistical analysis, using the Wilcoxon Signed Ranks test, was completed of the claims (> \$0 in losses) and losses per \$100,000 of payroll. Wage inflation is a factor, which would explain some decrease in claims and losses per \$100,000 of payroll in the study. Because of lack of agreement on how to control for wage inflation during the time period, no adjustment was made to the payroll dollars. This decision was also influenced by a change in how the Bureau of Labor Statistics compiled wage statistics during the time period. An analysis of claims frequency during the same time period showed that across all risk types, claims per \$100,000 of payroll decreased by 3.5% and losses per \$100,000 of payroll increased 18.69%. Compared to the results seen, the impact of wage inflation seems to be relatively minor.



Model Safe Patient Handling Program (cont.)

Table 1 shows the change in the number of claims per \$100,000 of payroll between the two time periods (before and after the SPH program mandate) analyzed in the study. The types of claims analyzed were:

- All SPH-related claims: all claims related to safe patient handling, including resident transfer from the floor after a resident has fallen and all of the other categories below
- SPH transfer claims: claims associated directly with the transfer of a resident (such as from bed to wheelchair; wheelchair to toilet and wheelchair to shower chair)
- SPH assisting claims: claims associated with assisting residents in bathing, toileting, dressing and other personal issues
- SPH repositioning claims: claims associated with repositioning residents in their beds or wheelchairs
- Combative resident claims: claims associated with residents having aggressive behaviors directed toward staff

All SPH-related claims decreased a statistically significant ($p < .05$) 37.34%. Of those claims, statistically significant reductions occurred with transfer claims decreasing 55.29% and combative resident claims dropping 40.91%. SPH assisting claims increased 12.50% and repositioning claims dropped 25%; however, neither was statistically significant. There was some surprise with the reduction in combative claims; however, after further discussion and review, we feel the decrease is due to the less physical nature and increased physical separation between caregiver and resident when using mechanical transfer equipment.

Claim Frequency	All SPH Related Claims	SPH Transfer Claims	SPH Assisting Claims	SPH Repositioning Claims	Combative Resident Claims
% Change between first and last study periods	-37.34%	-55.29%	12.50%	-25.00%	-40.91%
<i>p</i>	0.000	0.000	0.098	0.474	0.017
<i>Z</i>	-4.241	-5.429	1.653	-0.717	-2.392

p and *Z* Based upon Wilcoxon Signed Ranks Test

Table 1. Study results of claims per \$100,000 in payroll.

Table 2 shows the change in losses per \$100,000 of payroll for the two years before a SPH program was mandatory to the two years after implementation. A statistically significant reduction of 63.24% (in costs per \$100,000 of payroll) was seen in claims from resident transfer. A statistically significant increase of 163.04% in SPH assisting losses was also seen. It is important to realize that even with the significant increase in cost, the average assisting claim cost is only 15% of the cost of an average nursing home claim, having little relative impact on overall losses.

Overall the cost (per \$100,000 of payroll) of all SPH claims dropped 39.12%; however, the reduction was not statistically significant. The lack of statistical significance was due to the large variation in losses per \$100,000 of payroll per account. However, I am unaware of any insurance company that would scoff at a 39% reduction in claim costs, regardless of the result being significant or not. Also seen in the claim cost per \$100,000 of payroll were non-statistically significant reductions in costs for repositioning claims and combative resident claims.



Claim Costs	All SPH Related Claims	SPH Transfer Claims	SPH Assisting Claims	SPH Repositioning Claims	Combative Resident Claims
% Change between first and last study periods	-39.12%	-63.24%	163.04%	-1.56%	-27.78%
<i>p</i>	0.870	0.004	0.047	0.110	0.781
<i>Z</i>	0.164	-2.918	1.982	1.599	0.278

p and *Z* Based upon Wilcoxon Signed Ranks Test

Table 2. Study results of losses per \$100,000 in payroll.

Back injuries, which were the impetus for developing a SPH program, decreased by 36.97% ($p = 0.001$, $z = -3.243$) during the study period. While back injury costs decreased 17.74%, it was not a statistically significant decrease ($p = 0.623$, $z = 0.49$). While most organizations would appreciate such a decrease in claims costs, it is understandable that this decrease is not statistically significant given the large variation in back injury costs.

These results are important as they show transfer claims and their associated costs in nursing homes are significantly reduced from before to after the mandated implementation of a SPH program. While certain types of claims saw increases in frequency, severity or both, they should not discourage a nursing home from undertaking a SPH program. What the results should do is encourage organizations to adopt a comprehensive SPH program that appropriately addresses all sources of resident transfer-related injuries, minimizing their frequency and severity of occurrence.

Ergonomics Branch Seeks New Members

We are a hard-working, fun-loving group who enjoys exchanging ideas, solutions and new innovations. The Ergonomics Branch is always looking for new members to join our ever-growing group, and we hope to become a standalone practice specialty soon. To find out more about the Ergonomics Branch and to volunteer to get involved, visit us at <http://www.asse.org/practicespecialties/ergonomics/>.

