State of Washington
Department of
Labor and Industries

SHARP
# Innovations

Reporting a Year of Progress
Safety & Health Assessment & Research for Prevention
Washington State Department of Labor and Industries

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# Promoting Safe and Healthy Workplaces Through Innovative Research

SHARP stands for Safety & Health Assessment & Research for Prevention. SHARP is a multidisciplinary research program within the Washington State Department of Labor and Industries, whose mission is to conduct research, monitoring, and demonstration projects that promote healthy work environments and the prevention of workplace injuries and illnesses. SHARP was created by the Washington State Legislature in 1990.

Since 1990, SHARP has addressed a diverse range of occupational health concerns in response to requests from employers, labor, health care professionals, and agency staff. SHARP's research specialists offer expertise in computer systems, epidemiology, ergonomics, industrial hygiene, occupational medicine and nursing, and toxicology.

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## Introducing Strategies for Injury and Illness Prevention

**Ergonomics Reduces Back and Arm Problems at Aluminum Mills** Ergonomics is the science of fitting jobs to workers—making jobs safe and productive by designing them to fit the strengths and limitations of workers. Preventing musculoskeletal injuries by applying ergonomic principles addresses the most common and costly types of work-related health problems. SHARP has worked with two aluminum mills that have been applying ergonomics to jobs since 1991. SHARP analyzed jobs and conducted physical examinations before and after job improvements. At Kaiser Mead Works, the joint labor management ergonomics committee used SHARP training, worked with employees and supervisors, and put into place engineering controls and self-managed teams. In a 1996 assessment, SHARP found that ergonomic problems and musculoskeletal disorders were reduced at both mills. Back and arm disorders among carbon-setters (a particularly hazardous job) were cut in half (see Figure 1). The durations of awkward postures were halved (see Figure 2). The lessons learned from these participatory ergonomics projects are applicable to many Washington workplaces.

*Figure 1. Percent of Workers with Arm and Back Disorders Before and After Ergonomic Improvements*

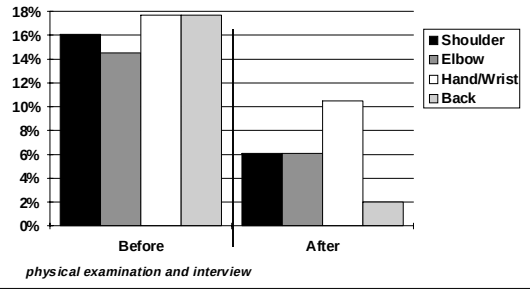
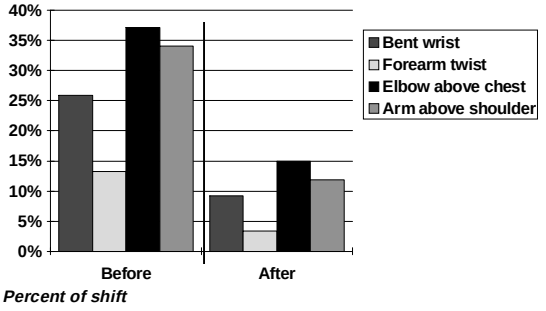



*Figure 2. Percent of Work Shift Spent in Risky Postures*



**Getting Lead Poisoning out of King County** Although it has been known for centuries that lead can cause serious health effects (for example, permanent brain and kidney damage), workers in Washington State are still being over-exposed to this toxic metal. SHARP is working to prevent occupational lead poisoning in cooperation with NIOSH (the National Institute for Occupational Health and Safety). SHARP's program, the King County Adult Lead Exposure Reduction and Testing (ALERT) project, provides education and incentives to lead-using employers, to help them reduce worker exposures. ALERT encourages lead-using employers (including radiator repair shops, scrap metal shops, indoor firing ranges, and others) to provide blood-lead testing for employees. SHARP personnel also help employers remedy workplace practices that cause over-exposure to lead. SHARP's goal is to eliminate lead poisoning in Washington State workers.

**Will Ergonomics Prevent Injuries in Tree Nursery Workers?** Nursery workers are at high risk of serious musculoskeletal problems from work. In order to prevent these injuries, SHARP is conducting a three-year ergonomics research project in cooperation with NIOSH, and will also look at the special problems of seasonal work. The study will contribute to the health, safety, and productivity of tree nursery work. The results will be shared with other tree nurseries and the general farming community.

## Exploring Specific Risk Factors and Health Problems

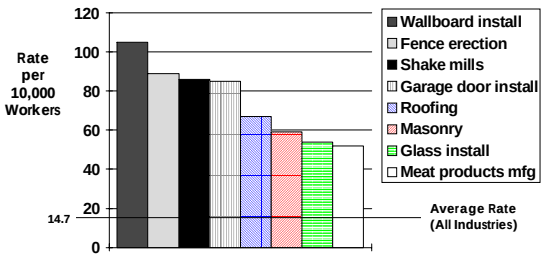
**Protecting Construction Workers from Injuries due to Falls** Falls in the construction industry are one of the most common and serious types of workplace injury. New safety rules on fall protection became effective in February 1991. SHARP examined workers' compensation lost time claim rates for falls among employers that were cited for violating the standard over 1991- 1992, and compared them to similar employers who had not been inspected. Fall injury rates for the periods before and after inspections were compared. Employers cited for fall protection violations were 2.3 times more likely than other employers to reduce their rate of compensable injuries from falls (after adjusting for employer size and type of business). This study suggests that safety inspections are effective in decreasing rates of injury due to falls.

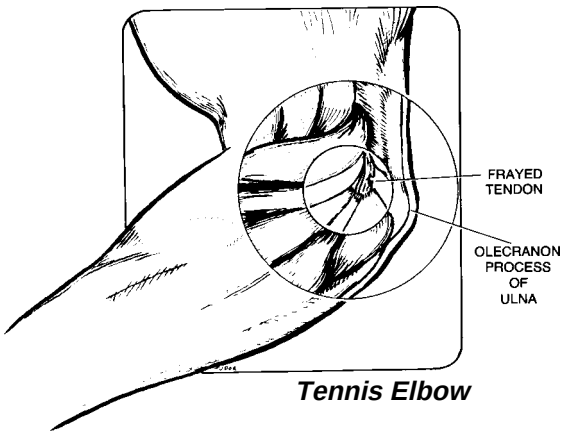
*High-rise construction: high risk for falls.*

**Does Aluminum Smelter Work Cause Asthma?** Rising rates of asthma are a major cause for concern. It is important to understand what causes asthma so we can prevent causative exposures. There is international concern about asthma in aluminum smelter workers, and Washington State has the greatest concentration of aluminum smelters in the country. Management and labor at one of these plants asked for SHARP's assistance in assessing respiratory health among smelter workers. SHARP has begun a multi-year study, including an intensive health assessment and detailed exposure assessment. Results will be used to make recommendations that will be useful statewide, nationally, and internationally.

**Tennis Elbow Comes from More than Playing Tennis** During 1993, more than 1700 Washington workers were compensated by L&I's State Fund for work-related epicondylitis (inflammation of the tendon at the outside of the elbow, also known as tennis elbow) — twice as many as in 1987. Of these affected workers, 400 lost more than 16 weeks of work. SHARP found that workers in certain jobs were at much higher risk for epicondylitis than the rest of the workforce, and not only those in "non-contact ball sports" (who are at 48 times the average risk). Other high rate groups over a seven-year period are presented in the graph. Workplace risk factors for epicondylitis include repetitive twisting of the forearm (like when using a manual screwdriver), repetitive or prolonged forceful hand work with the wrist bent away from the palm (extended), with the palm facing down (forearm pronation), repetitive flexing, and extending the elbow with force (like when hammering). Reducing as many of these risk factors as possible, or their duration, will prevent cases of tennis elbow.

*Tennis Elbow: High Risk Industries*
*State Fund Workers Compensation Data 1987-1993*




***Tennis Elbow***

**Preventing Violence in Washington Workplaces** Violence in the workplace is a major concern to Washington's workers and employers. SHARP has conducted several studies looking at workplace violence, including investigating assaults on staff in state hospitals, publishing injury rates due to workplace violence, and evaluating the effectiveness of the state's Late Night Retail Regulation. SHARP surveyed establishments where employees are at risk of robbery-related injuries. 21% of businesses covered by the Late Night Retail Regulation had been robbed in the past 5 years. Other businesses that are not covered by the regulation, either because they are not open at night or because they are exempted from the regulation (restaurants and hotels, for example), were also at high risk of robbery. The results show that high-risk employers would benefit from robbery/crime prevention activities, regardless of their hours of operation.

**Poorly Maintained and Leaky Buildings can Harbor Hazardous Fungi** Certain fungi that grow in water-damaged buildings can produce spores and toxic chemicals that may cause serious health problems. Working with the state's Department of Health, SHARP participated in an investigation of a Longview building that is contaminated with fungus. SHARP staff presented complex sampling data to the building staff and County Commissioners; answered the staff's questions about health effects of indoor bacteria and fungi; designed an extensive sampling plan to characterize the toxigenic fungi in the building; reviewed previous environmental evaluations; coordinated a NIOSH Health Hazard Evaluation, including an epidemiological investigation; identified a qualified area physician, so that all affected staff could receive consistent health care; and assisted the building manager in designing a clean-up plan.

**Exposure to Metalworking Fluids in Washington State** SHARP is currently investigating the uses of and potential exposures to metalworking fluids (including coolants and machining oils) in Washington State. Some metalworking fluids are complex mixtures of toxic chemicals that have been shown to cause dermatitis, asthma, and cancer in exposed workers. Therefore, NIOSH is recommending lower exposure limits, and OSHA (the Occupational Safety and Health Administration) designated these materials as a priority for comprehensive rule-making. SHARP estimated that approximately 20,000 workers use metal working fluids in Washington State. SHARP's review of OSHA's data revealed that the current Permissible Exposure Level is exceeded at several workplaces in this state. Consequently, SHARP is visiting machine shops throughout Washington, gathering information on workplace practices, and helping employers reduce exposures to workers. SHARP will be releasing a set of educational materials to workers and employers in 1997.

## Tracking Conditions Related to Work

**Preventing Lead Poisoning in Washington Workers** Part of SHARP's efforts to eliminate lead poisoning in Washington workers is based on identifying individuals with high blood lead levels. Blood lead levels for Washington workers are reported to and tracked by SHARP, in collaboration with the State Department of Health's Office of Epidemiology. Test results for over 12,000 workers have been received by the Lead Registry since it began in 1993. Approximately 5% of the tested individuals are overexposed to lead. SHARP works with employees, employers, and health care providers to reduce lead exposures in the workplace. We have provided technical support for over 1200 customers and will continue this outreach to reduce lead exposures in Washington workplaces.

*Lead-containing solder is a source of lead over-exposure in the radiator repair industry.*

**SHARP Survey Finds 30% of Acute Care Hospitals Report Problems with Latex** SHARP's tracking program found that latex gloves are one of the most common causes of work-related skin rashes in Washington State. Exposure to latex protein can cause individuals to become sensitized. Once sensitized, exposure to a small amount of latex can cause several problems, like runny nose, conjunctivitis, hives, asthma, anaphylactic reactions, and even death. SHARP surveyed acute care hospital staff to determine how much they know about the problems with latex and what Washington hospitals are doing to deal with the problem. With 95 (93%) hospitals returning completed questionnaires, 30% reported having "problems" with latex allergies among employees in their facility. More than 60% of the hospitals had made some type of glove alternatives available to affected employees, 4% had designated latex-free zones, 4% had cleaned to remove latex dust, while 7% had done nothing. An information package on latex allergies will be developed and sent to health care facilities.

**Tracking Work-Related Skin Conditions** Dermatitis is the second most commonly reported occupational illness; over 1000 claims are accepted for skin conditions in the Washington State Fund each year. NIOSH recently included dermatitis as one of its priority research areas in the National Occupational Research Agenda. The more we know about what causes these skin diseases, the more effectively we can target prevention efforts. Through a cooperative agreement with NIOSH, SHARP staff designed and developed an exper-

imental epidemiologic tracking program for occupational skin diseases in Washington State. In addition to claims information extracted from the workers' compensation data, over 250 cases were reported by voluntarily cooperating health care providers from April of 1994 through September of 1996. The "sentinel" provider data appear to be better in identifying specific sources, while the workers' compensation data have allowed the identification and investigation of clusters of cases.

**What are Other States Doing to Track Workplace Injuries and Illnesses?** Tracking the occurrence of illnesses and injuries makes it easier to prevent them from occurring in the future. Although health department epidemiologists receive reports of many infectious diseases, this kind of information is not usually collected for work-related diseases. When the legislature asked state agencies to develop a plan to make occupational diseases reportable in Washington State, SHARP worked with business, labor, health care providers, the Department of Health, the State Board of Health and other interested parties. SHARP surveyed all 50 states to determine which occupational conditions they track, and what makes the tracking systems succeed or fail. SHARP found that two-thirds of states mandate the reporting of occupational conditions; the success of these tracking systems depended on specific reporting requirements and adequate funding. These results were incorporated into the Board of Health's plan, which now awaits further action by the Health Department's Office of Epidemiology. A survey report will be available in 1997.

## Testing Methods for Identifying Risks

**Incorporating Ergonomics Training in Carpentry Apprenticeship Programs** One important way to help people work safely is to teach them safe work practices from the first day they start a new trade. In collaboration with the United Brotherhood of Carpenters, local construction contractors, and the Washington State Labor Council, SHARP is working to incorporate ergonomics awareness training into the orientation for carpenter apprentices. The training includes demonstrations and brainstorming solutions for tasks with high physical loads. The "Train-the-Trainer" approach and accompanying manual, developed as part of this project, has been used in apprenticeship programs across the country. The first part of the project is completed. Interviews conducted with almost 200 participants after training indicates that similar training is needed for journey-level carpenters, other trades, supervisors, and superintendents. Apprentices now incorporate "STOP, LOOK, THINK, ACT" into how they approach doing their jobs. SHARP is now analyzing injury data to see if the ergonomics training prevents musculoskeletal problems.

**Biomechanical Assessment System for Ergonomics (BASE)** While many businesses want to implement ergonomic principles, they are frustrated by the lack of good, readily available tools to measure ergonomic risk factors. To meet this need, SHARP has set out to integrate currently available equipment to build a system to accurately measure risk factors for musculoskeletal disorders in workplaces. BASE is a portable computer-based system that will measure and record joint positions, muscle force, and repetition on the job. SHARP has assembled the basic device; the unit has been tested in our ergonomics laboratory and field-testing is just beginning. The BASE system will be improved as a result of collaboration with other researchers; a multimedia video task analysis (MVTA) system designed by the University of Wisconsin-Madison will be evaluated. This new technology adds a video image to the measurements of position, force, and repetition. SHARP's system will be integrated with the MVTA and studies of the system's usefulness are planned in the poultry, tree nursery, and construction industries.

**Using Video Overlay to Reduce Worker Exposures** SHARP is developing new technologies that can be used to teach workers how to perform hazardous jobs more safely. Video overlay is one such technology, where electronically measured and recorded exposure data are converted into graphic images (e.g., moving bars on a graph). The graph is then overlaid onto a video tape of the exposed workers at their tasks. The final product is a composite video image of the worker and the exposure level. (A simulated video overlay image is shown in the Figure.) As the worker varies tasks, the exposure level also varies (i.e., the bars on the graph move up or down in response to the measured exposure level). Video overlay can be used in worker training and exposure assessments. As a worker training tool, it can be used to identify site- and task-specific work practices that reduce or increase exposures (i.e., document the "right way" and the "wrong way" to perform a task). As an exposure assessment tool, video overlay pinpoints peak exposures, allowing the employer to focus scarce resources on the source of a problem.

*Video overlay is used to assess exposures and/or train employees in proper work practices.*

**Evaluating the Ergonomics of Construction Tools** Intense interest has developed around replacing tools that contribute to work-related musculoskeletal disorders (hammers and vibrating tools, for example). SHARP is working with carpenters and contractors to assess new tools that may reduce ergonomic risk factors. Designing better tools must involve collaboration between construction workers, construction contractors, tool manufacturers and ergonomists. SHARP promotes a three-phased approach: 1) Does the tool do the necessary job on the construction site? If yes; 2) Evaluate it in a controlled setting to see if it reduces musculoskeletal load. If so; 3) Test the tool on construction sites for both production and ergonomic effects. The goal is to introduce tools that make the job easier and better, while preventing musculoskeletal disorders. An "ergonomic shovel" did not pass Phase 1, hammer testing is in Phase 2, and a wallboard panel lift is scheduled for Phase 2. Findings of this project will improve health, safety, and productivity, and will be shared with construction contractors and workers.

**Preventing Musculoskeletal Disorders in Health Care Workers: Developing Methods to Assess Patient-Handling Tasks** Handling patients is a complex and demanding task that results in thousands of work-related back and shoulder injuries in health care workers each year. Solving the ergonomic problems associated with patient-handling requires methods to measure the factors that cause injuries. SHARP is working to prevent these injuries by participating in a national effort to assess patient-handling in nursing homes and hospitals. Many factors need to be considered, including the condition of the patient/resident (ability to help or resist, special medical conditions, medical tubes or appliances attached to the patient), the environment (obstacles, tight spaces), the equipment available to assist, the staff available to assist, and the skill or training of the caregivers. Collaborators have included researchers and practitioners from the Universities of Wisconsin and Massachusetts, NIOSH, OSHA, Service Employees International Union, and the National Health Care Association. SHARP is piloting different versions of the assessment tool in a local nursing home to ensure that it is usable in the workplace.

# Workplace Health and Safety Problems?

SHARP's staff are available to help you address a wide range of occupational health concerns. Our staff assist workers and employers with complex health and safety issues, deliver seminars, present research findings, provide independent scientific review of issues, and publish information.

To request SHARP's services or obtain additional information about the program, please contact us at:

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## How does SHARP determine research priorities?

SHARP receives a variety of requests for research efforts. To date, SHARP projects have been initiated externally from union representatives, management, health care providers, and the legislature, or internally among staff or other L&I divisions. Potential projects are evaluated by a priority system that asks:

*What is the magnitude, severity, and urgency of the problem?*
*Is there already similar research available?*
*Is there interest from labor and management?*
*What is the estimated degree of preventability of the problem?*
*What is the probability of the project being completed?*
*Is this an emerging problem?*
*What resources are available?*
*Are there significant gaps in knowledge?*
*Are there any policy implications?*

SHARP's research is independent and confidential, although summary information (which does not identify employers or participants) is shared with workers and employers across Washington State.

# Program Information

## SHARP's Mission

SHARP conducts research, monitoring, and demonstration projects that promote healthy work environments and the prevention of workplace injuries and illnesses.

## SHARP's Goals

The collaborative knowledge and creativity of SHARP's multi-disciplinary research team is focused on accomplishing the following goals:

*SHARP Develops and Analyzes Data for Injury and Illness Prevention.*

SHARP develops systems of data collection and analysis to track occupational hazards, injuries and illnesses. These systems are used to identify emerging problems and evaluate the effectiveness of prevention activities.

*SHARP Tests Hypotheses and Develops Methods for Evaluating Workplace Exposure and Health*

SHARP designs and conducts field research in Washington workplaces using scientific methods that address specific questions concerning the causes of occupational injuries and illnesses, and ways to prevent them. SHARP develops and tests new methods to identify and measure workplace hazards, illnesses and injuries.

*SHARP Provides Information and Promotes Technology Transfer*

SHARP provides technical assistance and disseminates technical/scientific information and knowledge of new technology.

*SHARP Serves as a Scientific Resource*

SHARP fosters the best use of current scientific knowledge in agency operations.

# Check out SHARP on the World Wide Web!

**http://www.wa.gov/lni/sharp**

SHARP's web site provides more information about the SHARP program, describes SHARP's research interests, lists our publications (some are available on-line), introduces the SHARP team, and provides links to other sites of occupational and environmental interest.

## SHARP has worked with:

Association of Washington Business • Washington State Labor Council • Timber Operators Council • Telecommunications Industry • United Steel Workers of America • United Food & Commercial Workers • Aluminum Industry • Pulp and Paper Industry • Poultry Processing • Fish Processing • Radiator Repair • Firing Ranges • Growers • Farm Workers • University of Washington • Northwest Center for Occupational Health and Safety • Washington State University • Washington State Association of Occupational Health Nurses • American Industrial Hygiene Association • Northwest Association of Occupational & Environmental Medicine • The Evergreen State College • Washington State Nursing Association • American Conference of Governmental Industrial Hygienists • Workers Compensation Advisory Board • L&I Division of Consultation and Compliance • Washington State Department of Health • Washington State Department of Social and Health Services • Washington State Department of Corrections • Washington State Department of Community, Trade, and Economic Development • Washington State Department of Revenue • Washington State Department of Ecology • Thurston County Health Department • L&I Division of Insurance Services • American National Standards Institute • Occupational Safety and Health Administration (OSHA) • California Occupational Safety and Health Administration • U.S. Department of Labor • National Institute for Occupational Safety and Health (NIOSH) • National Safety Council • Washington State Medical Association • WISHA Monitoring Committee • Environmental Protection Agency • Painters Union & Management Organizations • Lumber Plywood Mills • Washington Committee for Occupational Safety & Health • Northwest Wall & Ceiling Industry Trust Fund • United Brotherhood of Carpenters and Joiners of America • Construction Advisory Council • and many others

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