

# From Research to Practice: The Application of NIOSH Model Ergonomic Program in a Healthcare Setting

By Manny Halpern, PhD, CPE

## Abstract

NIOSH guidelines do not address ergonomic concerns related to patient safety. Thus, the ergonomic concerns in healthcare go beyond musculoskeletal injuries.

The National Institute for Occupational Safety and Health (NIOSH) published guidelines for setting up a good ergonomics program that focuses on prevention of the work-related musculoskeletal disorders in the manufacturing and service industries. This pilot study applied the NIOSH model in a specialty hospital and attempted to examine its relevance to healthcare settings.

With very few recordable musculoskeletal injuries, the program was set up in a pathology department where management was willing to collaborate rather than where a need was urgent. The program was therefore set as a stand-alone and adapted to address ergonomic issues related to computer terminals in the lab and offices. A task force was set up and assessed the design of the computer workstations using a standard checklist, musculoskeletal symptoms were surveyed and a series of focus groups and training sessions in Healthy Computing were conducted for labor and management. Products were selected to address the ergonomic deficiencies noted in the design of the workstations.

The action steps that could be implemented during the project were compared against the guidelines of the NIOSH model ergonomics program. The pilot study revealed that of 41 items listed in NIOSH model, 30 (73 percent) were applicable to the hospital environment. However, the ergonomic concerns in healthcare go beyond musculoskeletal

injuries of the care providers, and the NIOSH guidelines do not address ergonomic concerns related to patient safety. Other criteria may have to serve for selecting an intervention site and assessing the impact of the program. Three conclusions can be drawn: 1) the impact of the ergonomic program may not be manifested in OSHA logs but rather in reduction of lost work time due to non-work-related health problems; 2) to make the ergonomic program more effective, link it to patient safety and risk management; and 3) more research is needed to link the ergonomic concerns of both employees and patients in a healthcare setting.

## Introduction

Guidelines for what is a good ergonomic program have been available for some time in the manufacturing and service industries. However, the challenge is to adapt these guidelines to the healthcare services. With funding from the Universities Occupational Health and Safety Education Research Center (ERC), a pilot project was initiated to apply the NIOSH model for setting up an ergonomic program for prevention of work-related musculoskeletal disorders (WMSD) and to examine its relevance to a particular department at a specialty hospital. The aim was to identify who can participate, how and what measures might be feasible. The program could serve as a model for other departments in the organization, with the results also benefiting other healthcare facilities.

From the outset, the pilot project was conceived as a stand-alone, rather than as part of a hospital-wide health and safety program. With very few recordable musculoskeletal injuries, the data of the hospital could not help in implement-



Figure 1. Sample collection in the lab

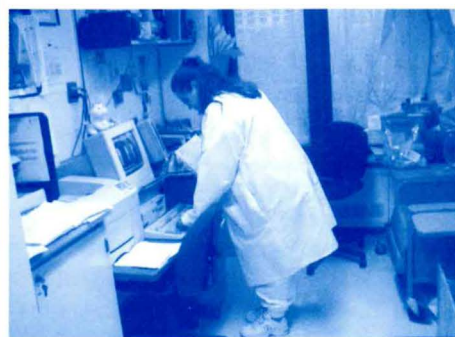


Figure 2. Data entry in the lab

ing the first step of the program: identifying targets for intervention. Other criteria were needed up front to select an intervention site: management willingness to host the program and a manageable staff size. Pathology & Laboratories met these criteria. The department had 28 employees, the majority (about 68 percent) consisted of technical staff (lab technicians and pathologists,) and the rest were administrative or clerical. Since all staff



was increasingly using Video Display Terminals (VDT,) the initial focus of the ergonomic program was on Healthy Computing. However, it is the process and the impact on research and practice that are the focus of this report.

## Method

The NIOSH program from 1997 consists of seven steps. A review of the content identified 41 action items. These served as the basis for the actions needed to be taken in the pilot project.

Instead of injury records, a symptoms survey was distributed during three kick-off meetings, which introduced the project to the staff and functioned as focus groups for eliciting ergonomic issues encountered by the staff.

The office manager assigned two staff members – a supervisor and a lab technician – to an ergonomic task force that would assist the investigator. The office manager supervised and supported the activities undertaken.

A VDT checklist – Performance Oriented Ergonomic Checklist for Computer (VDT) Workstations – served to assess the design of all 19 computer workstations. The investigator completed the checklist; a subset was assessed by one of the task force members and compared to the findings of the investigator. These results served as context-specific examples in four one-hour Healthy Computing training sessions. A walk-through conducted a month after the training sessions attempted to note layout changes undertaken by the staff.

Based on the checklist, the investigator and the task force developed a list of features that addressed the design deficiencies noted in the facility. Office products were identified, which met the requirement to alleviate risk factors related to musculoskeletal disorders. These products were then prioritized based on the impact on the number of workstations and the tasks that take place. The products were selected from catalogs of vendors doing business with the hospital and recommended as guidelines for Purchasing.

**Table 1. The Elements of Ergonomics Programs**  
NIOSH Publication No. 97-117 <http://www.cdc.gov/niosh/docs/97-117/default.html>  
(☒ implemented elements, ☐ elements not implemented)

NIOSH Program Steps	NIOSH Step Elements	NIOSH Clarifications
<b>One:</b> Looking for signs of a potential musculoskeletal problem in the workplace, such as frequent worker reports of aches and pains, or job tasks that require repetitive, forceful exertions.		
<b>Two:</b> Setting the stage for action. → Used 10 out of 12 elements	<input type="checkbox"/> 1) Ergonomics is part of the general H&S program. 2) Expressions of management commitment  <input checked="" type="checkbox"/> 3) Expressions of employee participation	<input type="checkbox"/> Policy statements <input checked="" type="checkbox"/> Meetings between employees and supervisors <input checked="" type="checkbox"/> Goals are set that become more concrete as they address specific operations. Resources for: <input checked="" type="checkbox"/> training the workforce <input checked="" type="checkbox"/> providing detailed instruction to leaders <input checked="" type="checkbox"/> bringing in outside experts <input checked="" type="checkbox"/> implementing ergonomic improvements as may be indicated <input checked="" type="checkbox"/> release time <input checked="" type="checkbox"/> Information is furnished to all those involved. <input checked="" type="checkbox"/> Evaluative measures track the results of the ergonomic efforts.
<b>Three:</b> Offering training to expand management and worker ability to evaluate potential musculoskeletal problems. → Used 9 out of 10 elements	<input checked="" type="checkbox"/> 1) Determine if training is needed.  <input checked="" type="checkbox"/> 2) Identify training needs. <input checked="" type="checkbox"/> 3) Identify goals and objectives. <input checked="" type="checkbox"/> 4) Develop learning activities. <input checked="" type="checkbox"/> 5) Conduct training. 6) Evaluate training effectiveness.	If there is a need to control ergonomic risk factors, then employees must be provided with knowledge to implement control measures.  Different categories of employees will require different kinds of ergonomics instruction. Training objectives must be defined in clear, directly observable, action-oriented terms.  Activities should help employees demonstrate that they have acquired the desired knowledge or skill. Take into account the language and educational level of the employees involved. Encourage asking questions. Encourage hands-on learning opportunities. <input checked="" type="checkbox"/> 1) Survey satisfaction with training. <input type="checkbox"/> 2) Knowledge gained or improvements in skills may be assessed in quizzes, performance tests. <input checked="" type="checkbox"/> 3) Class exercise - propose improvements on the basis of information learned in class. <input checked="" type="checkbox"/> 4) Evaluate change at the workplace.
	<input checked="" type="checkbox"/> 7) Improving the program.	
<b>Four:</b> Gathering data to identify jobs or work conditions that are most problematic, using sources such as injury and illness logs, medical records and job analyses. → Used 3 out of 5 elements	1) Health & medical indicators  <input checked="" type="checkbox"/> 2) Identifying risk factors on the job	<input type="checkbox"/> Following up of worker reports <input checked="" type="checkbox"/> Reviewing OSHA logs and other existing records <input checked="" type="checkbox"/> Conducting symptom surveys <input type="checkbox"/> Using periodic medical examinations  • Screening jobs for risk factors • Performing job analyses • Setting priorities
<b>Five:</b> Identifying effective controls for tasks that pose a risk of injury and evaluating these approaches once they have been instituted to see if they have reduced or eliminated the problem. → Used 3 out of 5 elements	Types of Controls <input checked="" type="checkbox"/> Engineering Controls <input checked="" type="checkbox"/> Administrative Controls <input type="checkbox"/> Personal Equipment  <input checked="" type="checkbox"/> Implementing Controls  <input type="checkbox"/> Evaluating Control Effectiveness	<input checked="" type="checkbox"/> Trials or tests of the selected solutions <input checked="" type="checkbox"/> Making modifications or revisions <input checked="" type="checkbox"/> Full-scale implementation  Bottom-line measurements like reduction in injury rates, absenteeism or turnover.
<b>Six:</b> Establishing health care management to emphasize the importance of early detection and treatment of MSD for preventing impairment and disability. → Used 5 out of 9 elements	Employer Responsibilities   Employee Responsibilities  <input checked="" type="checkbox"/> Health Care Provider Responsibilities	<input checked="" type="checkbox"/> Provide education and training regarding WMSDs (see Step 3). <input checked="" type="checkbox"/> Encourage early reporting. <input type="checkbox"/> Give health care providers opportunity to become familiar with jobs. <input type="checkbox"/> Provide accommodation. <input type="checkbox"/> Ensure confidentiality.  <input checked="" type="checkbox"/> Follow workplace safety and health rules. <input checked="" type="checkbox"/> Follow work practice procedures. <input checked="" type="checkbox"/> Reporting early signs and symptoms of WMSDs.
<b>Seven:</b> Minimizing risk factors for MSD when planning new work processes and operations.	Proactive vs. reactive approach	



## Results

The action steps that could be implemented during the project were compared against the items in the NIOSH model program. The elements of the NIOSH program are listed in Table 1, indicating the actions that were implemented. The pilot study revealed that of 41 items listed in NIOSH model ergonomics program, 30 (73 percent) were applicable to the hospital environment. Table 2 summarizes the actions taken for each of the seven steps of the model program.

Similar to our experience with other professional service industries in New York, the absence of recordable OSHA logs does not indicate the absence of musculoskeletal problems; these may be better gauged by symptoms surveys. In the target department, 68 percent of the respondents complained of musculoskeletal disorders and 10 percent lost work time because of the condition (wrist/hand problems.) These data were not reflected in the OSHA logs since they were not considered by the professional lab staff as work-related injuries. In this particular hospital, the impact should have translated to about 120 cases annually (assuming all are at a risk equal to that of the intervention site.)

The VDT checklist revealed that 19 design deficiencies common to more than 70 percent of the 16 stations result in trunk and head twisting while working with computers, and near falls due to stools slipping over the floors because the casters were inappropriate for hard floors. The walk-through conducted after the Health Computing training sessions did not detect any changes in layout undertaken by the staff. This may reflect more on the limitations imposed by the current equipment, such as bulky CRT monitors occupying the limited surface area on the workbenches, rather than on the effectiveness of the educational component.

However, the focus groups revealed numerous risk factors for WMSD only partially related to the use of VDT:

- Repeated and prolonged stooping while drawing blood, mainly from patients in wheelchairs (see Figure 1).
- Awkward posture while entering data into the computer (see Figure 2).

Table 2. A summary of the application of the NIOSH ergonomic program at a department in the specialty hospital

NIOSH program	Pilot program
1. Looking for signs of potential musculoskeletal problems at work → Used 10 out of 12 guideline elements	None available (see Step 4)  → OSHA logs at the hospital do not reflect prevalence or incidence of work-related musculoskeletal problems. Management willingness was the criterion that served to select an intervention site.
2. Setting the stage for action → Used 10 out of 12 guideline elements	The pilot project is a stand-alone in one department since there was no hospital-wide program for handling specific employee health & safety issues.
3. Offering training → Used 9 out of 10 guideline elements	4 one-hour sessions attended by 23 of 28 employees. Limit training to healthy computing; the other ergonomic concerns were not broad enough or transferable to other operations in the hospital.
4. Gathering data to identify problem areas → Used 3 out of 5 guideline elements	<u>MSD symptom survey</u> : 19 employees, 68% reporting symptoms in the last 12 months; 5 sought medical care; 3 lost work time (wrist/hand problems). <u>VDT checklist</u> : 19 design deficiencies common to more than 70% of the 20 stations result in trunk and head twisting while working with computers, and near-falls due to slipping stools. <u>Focus group</u> : awkward postures while drawing blood in the phlebotomy lab and computer data entry are attributed to facility design features that raise patient safety concerns.
5. Identifying effective controls and evaluating these approaches once they have been instituted → Used 3 out of 5 guideline elements	<u>Engineering controls</u> - flat monitors, new chairs and stools, and desk accessories. <u>Administrative control</u> - consider transferring some ICD code assignment from the pathologist to the typist. <u>Personal protective equipment</u> - Not applicable. Vendors visited the facility to set up two demo workstations. In view of the relationship between employee and patient safety in the blood drawing lab, the task force decided to separate the solution from the ergonomic pilot project.
6. Establishing healthcare management → Used 5 out of 9 guideline elements	As the pilot study took place in an orthopedic hospital, staff has numerous venues for addressing musculoskeletal problems.
7. Minimizing risk factors for MSD when planning new work processes and operations	11 process outcomes could serve to evaluate the pilot program as a whole 5 factors act as barriers for sustaining the program 3 factors act as facilitators  → There may be a relationship between employee and patient safety, thus the ergonomic concerns in healthcare go beyond MSD. These are beyond the scope of NIOSH program.

- Awkward posture while writing labels by hand.

These risk factors are attributable to the size, layout and lighting in the lab:

- The doorway and the sink at the entrance limit wheelchair access.
- Lighting is insufficient for drawing blood at the doorway.
- The lab room is too narrow for having patients recline.
- The lab room has no curtains around the patient chairs.
- The floor space is limited when patients are in the lab so the technicians enter data into the computer standing; however the desk is designed for sedentary operations.

- The software and the printer are not capable of printing labels.

Additional shortcomings have also been noted:

- The patients and their companions are standing in the corridor; there is no seated waiting area.
- The blood drawing carts are difficult to maneuver in and out of the lab or around the patient beds.
- The carts do not enable data entry on the floor, so that has to be done in the crowded lab.
- The baskets for drawing blood on the floor need to be re-evaluated for comfort and safety.



These ergonomic issues raised unexpected questions about compliance with the requirements of the Americans with Disabilities Act (ADA), the safety of patients in the lab, and the consequences of making errors while entering data into the computer in the lab. This raised questions regarding the responsibility for addressing patient comfort and safety separately from employee ergonomics.

Finally, the project identified several performance measures that serve to evaluate process outcomes, facilitators and barriers that affected the introduction of the ergonomic program (see Table 3). At the departmental level, the main facilitator proved to be management support in allocating time and funds through the operating budget, while the absence of an action plan secured by funding proved to be a barrier for expanding the program a year after the submission of the report.

## Conclusion

1. Most of NIOSH guidelines can be transferred to healthcare services. However, OSHA logs in hospitals may not reflect prevalence or incidence of WMSD. Other criteria may have to serve for selecting an intervention site and assessing the impact of the program. As a lesson from research to practice, the impact of the ergonomic program may not be manifested in OSHA logs but rather in reduction of lost work time due to non-work-related health problems.
2. NIOSH guidelines do not address ergonomic concerns related to patient safety. Thus, the ergonomic concerns in healthcare go beyond musculoskeletal injuries. Addressing these concerns requires a systems approach – an examination of the processes within the department, but also their interface with other units. The lesson from research to practice is: to be effective, link the ergonomic program to patient safety and risk management.
3. While the NIOSH ergonomic program focuses on prevention of WMSD of the employees, it became evident that in healthcare facilities, ergonomic issues need to consider the relationship between employee and patient safety. In addition to collecting information on employee injuries and WMSD, we

Table 3. Performance measures - process outcomes, facilitators and barriers

### Process outcomes to document program performance:

- Establishment of an ergonomic task force
- Records of the meetings of the ergonomic task force
- Kick-off meetings or focus groups
- Healthy Computing training sessions
- Staff attendance in the meetings
- Management participation in the meetings
- Identification of design deficiencies in VDT workstations
- List of products for VDT workstations
- Contacts with Purchasing, Engineering and Environmental Services
- Contacts with vendors
- Identification of patient safety concerns

### Facilitators:

- Several stakeholders throughout the organization have become aware of the pilot ergonomic program.
- The department management initiated purchasing of some standard ergonomic products out of the operating budget.
- Two vendors consider helping to set up demonstration workstations in one lab and in a multi-user room.

### Barriers that may limit the long term effects of the program in Pathology & Laboratories:

- A one-hour training session is too short for initiating actual changes.
- The absence of ergonomic products limits the implementation of changes following the training.
- The list of ergonomic products assumes that flat monitors will be purchased; however, the order has not been approved yet.
- The list of ergonomic products for healthy computing in the labs does not conform to the standard items negotiated between Purchasing and the vendors.
- The budget of the ergonomic products needs to be secured.

need to collect information on patient injuries. To study the relationship, we need access to two separate reporting systems, one that is public and another that is confidential. The lesson from practice to research: relating patient injuries to employee WMSD requires a more complex investigation practice. More research is needed in this area.

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