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Implementing Participatory Ergonomics Teams Among Health Care Workers

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Three participatory ergonomics teams have been established among healthcare workers in a metropolitan medical center. Three teams, consisting of orderlies, intensive care unit nurses, and laboratory workers, were selected to provide a diversity of work activities and educational backgrounds. The effectiveness of these teams was assessed by observations of team interactions, by team members' perceptions of their effectiveness, and by the teams' success in identifying problems and implementing solutions. After 1 year, one of the three groups has been highly effective by these measures. To varying degrees, the groups encountered competing time demands and obstacles in implementing solutions within current administrative structures. For some groups of health care workers, participatory ergonomics teams seem to be an effective strategy to improve health and safety. This approach may not be feasible in all areas of health care, especially in high-demand clinical areas where patient needs may take precedence over the safety of health care workers. Am. J. Ind. Med. 32:190–196. *© 1997 Wiley-Liss, Inc.*

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INTRODUCTION

High rates of work-related musculoskeletal disorders are well documented among health care workers. The Bureau of Labor Statistics reported 31,400 registered nurses and 101,800 nursing aides and orderlies with occupational injuries or illnesses that required time loss from work in 1994 [US Department of Labor, 1995]; median days lost from work with these injuries was 6 for aides and orderlies and 5 for registered nurses. There were 311,700 cases of work-related injuries or illnesses requiring lost time seen among hospital workers, while 217,200 cases were seen in nursing home and personal care workers. Incidence rates in hospital workers and nursing home and personal care workers were 10.3 cases per 100 workers per year, and 16.5 cases per 100 workers per year, respectively. These figures represent an alarming degree of morbidity and temporary disability, especially because they do not include the many injuries and illnesses that did not necessitate time loss, nor do they include the injuries or illnesses which were not reported or recorded in the OSHA 200 logs.

There is an abundant and remarkably consistent literature documenting a high prevalence of low back pain and back injury among nurses, nursing aides, and orderlies, with an annual prevalence of significant back pain among nurses reported as 43% [Stubbs et al., 1983], 47% [Dehlin et al., 1976], and 47% [Estryn-Behar et al., 1990]. A less extensive literature points to high rates of upper-extremity musculoskeletal disorders in health care workers. Punnett [1987] found a high prevalence of upper extremity musculoskeletal disorders among a group of health care workers: 8.8% had shoulder disorders, 2.8% had elbow disorders, 4.3% had wrist disor-

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ders, 10.3% had hand disorders, and 6% had carpal tunnel syndrome. Cardiac sonographers and dental hygienists have been reported to be at increased risk of upper-extremity musculoskeletal disorders [Vanderpool et al., 1993]. High rates of work-related musculoskeletal disorders continue among health care workers despite efforts to control these costly problems. The annual rate of work related injuries among nurses and nursing aides averaged 12.7 per 100 workers for 1983–1987, 18.2 in 1992, and 16.9 in 1993, far above the target rate of 9 per 100 workers set in Healthy People 2000 [National Center for Health Statistics, 1994]. Changes in technology and increasing economic stresses in the health care industry necessitate investigation of new approaches to prevent and control occupational injuries and illnesses associated with health service delivery. Other studies have evaluated the effects of ergonomic interventions with health care workers [Owen et al, 1995; Feldstein et al, 1993; Tibbles et al, 1993; Charney, 1992: Garg and Owen, 1992; Owen et al., 1992; Charney et al., 1991: Linnemann et al., 1991]; to our knowledge, no study has described the effects of participatory ergonomics programs or other joint labor–management committees in the health care setting.

Worker participation in ergonomics problem solving has been an effective means of reducing work-related risks of injury and disease in the automobile manufacturing and meat packing industries. The use of participatory ergonomics teams in the red meat packing industry was effective in identifying musculoskeletal hazards and in developing solutions to eliminate or reduce worker exposure to these hazards [Moore and Garg, 1996]. In the National Institute for Occupational Safety and Health (NIOSH) publication, *Participatory Ergonomic Interventions in Meatpacking Plants*, Gjessing, Schoenhorn and Cohen [1994] stressed the importance of worker involvement in ergonomics programs. One form of employee participation is through Employee–Management Advisory Teams (E-MATs), used to foster a pro-active and cooperative approach to the prevention of musculoskeletal injury related to ergonomic factors. Like other participatory ergonomic programs, the E-MAT is designed to be a labor–management partnership that takes advantage of worker knowledge and problem-solving skills, to reduce resistance to change, and to improve workplace communication and worker motivation.

This project was undertaken to evaluate whether an E-MAT approach among health care workers was effective in the identification of health and safety problems, the identification of control strategies, and to evaluate the implementation of these controls. This paper reports the preliminary results of this ongoing demonstration project.

METHODS

Study Design

This phase of the demonstration project is an observational study of the first nine months of E-MAT activity among three teams of health care workers. The project was undertaken in the participatory action research model described by Israel et al. [1992]. The investigators worked collaboratively with the study populations in a research process characterized by participation, cooperation, co-learning, system development, empowerment, and balancing research objectives with the study population's objectives. This project has been reviewed by the Human Studies Committee at Washington University School of Medicine; approval for the project is on file.

Setting

The project site is a large metropolitan medical center with an Environmental Health and Safety Department and an Employee Health Department. E-MATs were integrated into the existing health and safety administrative structure at the targeted facility. Prior to implementation of the project, upper-level hospital administration committed itself to support the ongoing participation of E-MAT members during their normal working hours.

Study Populations

Three employee populations were identified within the participating center. The groups were selected because of the diversity of potential hazards which might be addressed, and because of the different educational backgrounds and work activities of the employees in these groups.

The first group included orderlies from the dispatch department, which employs approximately 100 workers. They were targeted because of back, knee, and shoulder injuries associated with lifting, moving, and transporting patients throughout the hospital system. The second group, consisting of intensive care unit (ICU) nurses, was targeted because of multiple job stressors, including long work shifts, psychological stress, heavy lifting, prolonged standing, and awkward postures. Approximately 50 individuals are employed in the ICU. Sonographers were originally identified as our third group because of prolonged, awkward, static postures of the upper extremity. Owing to time pressures, this group was unable to form an E-MAT. This group was replaced by workers from the clinical laboratories, which employs about 450 workers in a variety of roles, including phlebotomy, specimen intake, and technical analysis. Groups within the laboratory also reported problems with upper-extremity fatigue and strain.

The study facility is not unionized and has no formal labor representation for health and safety issues. Thus, the membership of each team relied heavily on the recommendations from administrative contacts in each of the three work areas. Membership was based on the requirements that the teams be composed of four to six members, that representa-

tion from both management and employees was necessary, and that the individuals have an interest in participating in the project. Each of the authors was assigned to one of the E-MATs to serve as a technical advisor and facilitator for the project.

Training Project Participants

Based on our review of training literature, the foci for our E-MAT training included exercises for team-building/group work, provision of basic technical information, and opportunities for application of knowledge. Initial training was limited to a single 8-hr session for the dispatch and ICU teams. The laboratory team, which was added at a later date, was limited to a single 4-hr training session.

Members of the E-MATs differed widely in educational background, work activities, and experience with group work. Since the E-MAT approach depends heavily on the abilities of the team members to work together to identify problems and implement solutions, we decided that the major focus of training should be on the development of effective skills for working as a group. A primary objective for training was thus to engage participants in learning experiences in order to establish rapport with other team members, to begin to recognize individual strengths and differences, and to experiment with various communication techniques.

Basic technical information consisted of an overview of ergonomics terminology, risk factors for musculoskeletal disorders, and the process for analyzing tasks. This initial session was meant to provide an introductory level of technical information that would establish a basis for ongoing education that could be provided to individual E-MATs in the context of problems identified. It was important, for our purposes, that the level of training be basic, since we felt that more extensive technical training would be perceived as overwhelming given the brief time dedicated to the initial training.

Opportunities for applying the basic technical concepts were provided during the training sessions. Our goal in this application process was to reinforce group skills. We hoped to reduce some boundaries related to worker–supervisor relationships by involving the team members in activities that facilitated collaborative effort. It was important, for our purposes, that each E-MAT member feel like an equal partner in the analytical and decision-making process.

Procedural and logistical information for implementing the E-MAT approach was integrated into all aspects of training. Each team member received a resource manual designed to provide basic information regarding the logistics of the project, suggestions for team process, technical information, suggested forms and methods of documentation, and lists of facility resources, including the names and phone numbers of contact personnel who might be needed to address ergonomic concerns.

Assessment of the Participatory Approach

The project was designed to evaluate whether E-MATs could be formed and sustained in a health care system. Since the E-MAT approach is dependent on the ability of team members to work together, it was important that our project include an ongoing evaluation component specifically designed to assess team members' perceptions of their own effectiveness. The E-MAT Team Evaluation was developed as a one page survey instrument to be completed by individual members of each team on a quarterly basis. The evaluation survey addresses four areas: quality, effort, communication, and resources. The quality section includes questions regarding how team members felt about the quality and success of ergonomic solutions they identified. The effort section contains questions about how the team members rated their satisfaction with how other team members participated in the process. Communication questions focus on the level and quality of communication within the group especially related to the acceptance and support for ideas presented by all team members. Questions related to the team members' satisfaction with the availability of resources and maintenance support comprise the fourth area. For each question, team members were asked to respond on a scale of 1 (strongly disagree) to 7 (strongly agree). Initial surveys were performed 2 months after the inception of the teams. Follow-up surveys were performed 4 months later.

In addition to the surveys, the project advisors who regularly participated as active members of the team observed team interactions. Each week the advisors met to review the activities of the E-MATs and to identify any problems impacting on the effectiveness of the groups. These observations form an important part of the evaluation of team effectiveness.

Team effectiveness is also being measured by the number of problems identified by each team and the number of solutions implemented successfully. A log of team activities is maintained by each E-MAT, including problems identified, possible solutions with time lines, and status of implementation of solutions.

RESULTS

Results of the baseline and first follow-up survey using the E-MAT Team Evaluation are presented in Table I. For each of the teams, the results from the 2-month survey were generally positive in terms of team communication and perceived ability to make a difference, although the ICU team demonstrated some initial concerns about lack of maintenance support in implementing solutions.

Comparison of the initial survey and the follow-up for the laboratory E-MAT indicated that perceptions of team effectiveness, effort, and support consistently improved from the initial survey. Improvements in scores were

TABLE I. Employee–Management Advisory Team Evaluations: Comparison of Questionnaires from 2 Months vs 6 Months[a]

	Dispatch		ICU		Laboratory	
	2 mo	6 mo	2 mo	6 mo	2 mo	6 mo
Quality						
Overall the E-MAT was successful.	5.67 n = 3	6.67 n = 4	4.50 n = 4	3.67 n = 3	5.25 n = 4	6.40[b] n = 5
Did you feel the E-MAT provided high quality ergonomic solutions?	6.33 n = 3	6.67 n = 3	5.25 n = 4	5.00 n = 4	4.00 n = 4	5.80[c] n = 5
Effort						
I am satisfied that I can turn to a fellow E-MAT member for help when something is troubling me.	5.33 n = 3	6.67[b] n = 3	5.00 n = 4	6.50 n = 4	6.25 n = 4	6.80 n = 5
I am satisfied with the way my fellow E-MAT members and I share time together.	6.00 n = 3	6.67 n = 3	5.00 n = 4	1.50[c] n = 5	6.00 n = 4	6.60[b] n = 5
I enjoy the tasks involved in my E-MAT responsibilities.	5.50 n = 3	6.00 n = 3	5.25 n = 4	3.00 n = 3	5.50 n = 4	6.40 n = 5
Communication						
I am satisfied with the way my fellow E-MAT members talk things over with me and share problems with me.	6.67 n = 3	6.67 n = 3	5.50 n = 4	5.00 n = 4	6.25 n = 4	6.80 n = 5
I am satisfied that my fellow E-MAT members accept and support my new ideas or thoughts.	5.67 n = 3	6.33 n = 3	5.50 n = 4	6.00 n = 4	5.75 n = 4	6.80 n = 5
I am satisfied with the way my fellow E-MAT members respond to my emotions such as anger, sorrow, or laughter.	5.33 n = 3	6.33[b] n = 3	5.50 n = 4	7.00[c] n = 4	5.25 n = 4	6.00 n = 5
Resources						
I received adequate support from our E-MAT leader (e.g., consulting, education).	6.50 n = 3	6.33 n = 3	5.75 n = 4	6.00 n = 4	5.75 n = 4	6.80[c] n = 5
I received adequate support from my supervisor for E-MAT activities.	7.00 n = 3	6.33 n = 3	6.00 n = 4	3.50 n = 4	5.00 n = 4	6.40[b] n = 5
I received adequate support in maintenance activities.	6.50 n = 3	6.33 n = 3	4.00 n = 4	2.00 n = 4	4.25 n = 4	6.60[c] n = 5

[a]Scale: 1 (strongly disagree) to 7 (strongly agree).
[b]$0.05 < P < 0.10$.
[c]$P < 0.05$ (Kruskal–Wallis test).

statistically significant ($P < 0.05$) for 5 of the 11 questions. Comparison of the 2-month and 6-month surveys for the dispatch team showed improved scores in quality, effort, and communication, two of which were of borderline statistical significance. The very high initial scores on the three questions related to resources had declined at follow-up. For the ICU group, there were decreases in average scores in several areas. Only three areas were scored as improved: the satisfaction of members with acceptance and support by fellow team members, the satisfaction with the way E-MAT members responded to individual emotions, and the adequacy of support from their E-MAT leader. All other areas were scored dramatically lower, including team members' feelings that the quality of the work was poorer than initially indicated, that the team was extremely dissatisfied with their effort especially related to amount and quality of time spent together, and that there was a lack of adequate support from supervisors and maintenance in facilitating the E-MAT process.

Advisor's observations indicated notable differences in how each group has functioned. Varying degrees of supervisory support have influenced how each of the groups has been able to address ergonomic problems. Meeting times for each group have varied with one group meeting less often that the other two. Implementation of solutions for some problems has been slowed by lack of maintenance support. The problems identified by each team and the number of solutions implemented are summarized in Table II.

TABLE II. Summary of E-MAT Activities
Preliminary Report: Demonstration Project

	Problems identified	Solution status
Dispatch E-MAT	1. Lack of standard procedures for lifting and moving patients	1. Procedural manual was developed and distributed to all dispatch employees and nursing supervisors in patient care areas (implemented).
	2. Inconsistent training procedures for employees	2. Training procedures were developed for new employees and in-service programs developed for all employees (implemented).
	3. Poor utilization of mechanical lifting equipment	3. Protocols for the use of mechanical lifting devices were defined, employees were on staffed use of the equipment and encouraged to use it (implemented).
	4. Patient safety in standing pivot transfers	4. Use of transfer belts is being investigated.
	5. Injuries from moving hospital equipment (e.g., beds, scales, wheelchairs)	5. Procedures for moving equipment are being defined.
CU E-MAT	1. Low light levels in patient rooms	1. Fluorescent lighting is being installed in patient rooms by clinical engineering (partially implemented).
	2. Noise from alarms at front desk area	2. Noise from alarms was dampened at the source to decrease noise at front desk area but still allow alarms to be heard on the unit (implemented).
	3. Uncomfortable computer chairs with no back support	3. New chairs were ordered (delivery pending).
	4. Potential back injuries from lifting and moving patients	4. Lifting and moving procedures identified by Dispatch E-MAT were adopted. In-service education on proper body mechanics techniques provided (implemented).
	5. Stress associated with ICU work	5. Methods of identifying stresses are being investigated.
Laboratory E-MAT	1. Fatigue from prolonged standing on tiled floors	1. Anti-fatigue mats have been evaluated (funding for ordering requested).
	2. Workstation discomfort in transcription area of laboratories	2. All workstations have been evaluated; chair, footrest, and keyboard adjustments have been made and ordering of equipment has been recommended. Chairs are being evaluated for comfort (adjustments completed, funding for ordering equipment requested).
	3. Design of laboratory areas for standing and seated work	3. Evaluation of the blood banking area is continuing. Chairs and footrests are being evaluated. Re-organization of bench space done on trial basis.
	4. Poor body mechanics and postures among phlebotomists	4. Problem being investigated.

The dispatch department E-MAT has been successfully established and continues to function as a cohesive team in which individual members share responsibilities. Although this team initially required leadership from the supervisor on the team, the members soon were able to evolve to a mature group where the leadership alternates between the members depending on the problems addressed by the group. Within 6 months, this E-MAT was able to develop standardized procedures for lifting, moving, and transporting patients throughout the hospital system, as well as a program for training and testing newly hired employees. Their initial successes have allowed this group to learn efficient management of their time and they are now able to identify problems, explore and propose solutions, and oversee implementation while meeting on a less frequent basis.

The ICU E-MAT has faced the most significant problems with establishing a team. Initially, there was support and enthusiasm for the project. As implementation efforts

continued, however, individual members were noticeably less enthusiastic and observably more stressed. The team consisted of members who rotate shifts (as required by the nature of ICU work) so that it was often difficult to meet at a specific time. A day had been targeted for their meetings but the time fluctuated based on the work schedules of the individual members. Patient responsibilities, high patient census, and inadequate funding for additional staff made the members unable to establish meeting times free from patient responsibilities. Team meetings thus took place on the nursing unit. Team meetings were frequently interrupted by requests to respond to patient needs and emergency situations (average of 12 interruptions per 1 hour meeting). This frequently resulted in delay of meetings, absences from meetings, or in some cases total cancellation of meetings. E-MAT members often expressed their frustrations with the increasing job responsibilities and the lack of uninterrupted time to commit to the E-MAT process. Initially, problems with lighting and noise in the ICU area were addressed as they were thought to be more easily defined problems amenable to solutions that could provide quick successes. When solutions to the problems involved maintenance support for implementation, frustration resulted when maintenance was not responsive to the requests of the team. Despite these frustrations, individual team members continue to be supportive of each other in the E-MAT process. Overall, however, the morale of the ICU E-MAT is observably lower than when the project was initiated.

The laboratory E-MAT was established 3 months later in the process than the dispatch and ICU groups. Initially, this team expressed concerns about application of technical information presented during their initial training session. Additional training was scheduled after the initial meeting of this E-MAT to allow them to more easily address problems identified in the medical transcription section of the laboratories. The additional content-specific training seemed to alleviate the team's initial insecurities. The supervisor participating as a member of this team initially assumed a leadership position. Other group members have begun to assume leadership roles for various projects as the group continues to transition to a mature group level.

Initially, the E-MATs relied on direction from the project advisors to initiate the process. As the intent was for the groups to be self-sustaining, advisory support has been withdrawn gradually, although there continues to be a need for periodic assistance and encouragement from project advisors.

DISCUSSION

This project was designed to study the establishment of E-MATs in areas of the medical center representing a diversity of potential hazards and employee groups. Three teams have now been successfully established. The dispatch and ICU groups were originally targeted to participate in the project and remain actively involved. The third group, from the laboratory area, was established slightly later in the project period when the existing administrative structure and clinical demands for the originally targeted sonography group precluded their participation in the project. Like the sonography group, the laboratory group was targeted because of symptoms of upper-extremity fatigue and strain.

E-MAT members' perceptions of their effectiveness were reflected in the baseline and follow-up surveys. Because the teams were small, there may not have been adequate statistical power to detect improvement in quality, effort, communication, and resources. Overall, however, the dispatch and laboratory groups' responses indicated that team members were satisfied with their participation in the project, and with their effectiveness as a team. In general, these perceptions improved with time. By contrast, the ICU group showed more negative perceptions on the follow-up survey. While individuals felt supported by fellow E-MAT members, there was a dramatic deterioration in perceptions regarding the quality of this latter team's work and lack of support from supervisors and maintenance personnel. Advisors' observations and perceptions of the implementation of the E-MAT process complement these self-perceptions of team members.

Two of the E-MATs, dispatch and laboratory, have been able to establish ''protected'' time each week for E-MAT meetings and activities. The lack of uninterrupted meeting time opportunities for the ICU staff seems representative of problems encountered in other clinical work areas. We were unable to form an E-MAT among sonographers because their clinical responsibilities precluded regular meeting times. As the current trends in ''downsizing'' hospital personnel continue in the face of increasing patient acuity, time pressures on clinical personnel are likely to become even more acute.

In the short time since the project was initiated, the E-MATs have been able to identify problems and solutions. Implementation of some solutions has sometimes been hampered by the inability of a large hospital system to respond to the format of the E-MAT process in such areas as purchasing equipment, repairing or altering work environments, and implementing new procedures. Implementation of solutions has been slower than anticipated as each team has struggled with learning the channels within the hospital structure for accessing the equipment and personnel needed for solutions. The early frustrations of team members with the process of implementation have dampened some of the initial enthusiasm of the team members. As the systems for implementation adapt to the E-MAT process, it should facilitate the E-MAT activities and afford team members more evidence of success in changing the work environment. Success in sustaining team efforts seems critically dependent on whether the worth of the group is felt by the individual members as well as those colleagues they represent.

This study reports only our effectiveness in creating and sustaining functional participatory ergonomics teams among health care workers. A larger scale investigation of effectiveness is warranted. We do not yet know whether the activities of the E-MATs will result in lower injury rates, reductions in musculoskeletal symptoms, or changes in job satisfaction among workers in the three study areas. Baseline and 6-month surveys assessing these outcomes are being collected and will be reported at a later date.

Several factors may limit the generalizability of our findings. Teams were not chosen randomly but were formed only where management expressed initial interest in the process. Individual team members were selected based in large part on their willingness to participate. Thus, the teams may not be fully representative of the wider health care worker population. Since a control group was not included in the study design, it is unclear whether the changes in attitudes among team members, and the ergonomic solutions they have proposed, were specific to this intervention or might have been achieved by other interventions as well.

The training provided to each team may not have been ideal. The dispatch and ICU teams received only 8 hr of training while the laboratory team training was limited to 4 hr. The length of training time was much shorter than that cited for successful participatory ergonomics teams in other industries. The training did allow orientation to the process and establish the need for ongoing training.

In summary, three E-MATs have been established within a health care environment. The dispatch and clinical laboratory teams have been successful by all preliminary study measures. The ICU team has been less successful in establishing a functional team. Similar to the initially targeted group of sonographers who were unable to form a team, the problem encountered by the ICU team was largely due to the extreme time pressures posed by clinical demands. The problems encountered by the ICU team and the sonography group raise questions of whether the E-MAT approach is applicable to all groups of health care workers. A multitiered approach, including E-MATs, may be needed to address the problems of musculoskeletal injuries within health care systems. As the project continues, it is hoped that realistic solutions to the problems encountered in implementing this approach can be identified.

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