

Sounding Board

Occupational therapists' critical value in work rehabilitation and ergonomics

Suzanne Bade and Jacqueline Eckert*

University of Michigan Health System, Ann Arbor, MI, USA

1. Introduction

Work Rehabilitation and Ergonomics, proactive and reactive, are practices that touch the lives of most employees and employers. Effective, evidence-based services are essential to successful outcomes. With the average age of most workforces now in the mid 40's, the complications of personal medical conditions affect worker production quality, quantity and job satisfaction. The aging of the "baby boom" generation and the anticipated effects on medical costs and work practices is of great interest to employees, employers, and the professional community including those who provide services in rehabilitation and ergonomics. While many professional disciplines provide services in those areas, occupational therapists offer a uniquely valuable holistic approach to the clients with whom they work. This paper will offer a review of the expertise of those trained as occupational therapists, the evolution of the profession's approach to work rehabilitation and ergonomics from WWI to the present, and will offer insight into the current state of best practices within this focus. To demonstrate this evolving practice, the authors will review the practice of OT work rehabilitation and ergonomics at the University of Michigan from the early 1900s to present day.

It is important to first consider how Occupational Therapy has been defined. According to the American Occupational Therapy Association (AOTA), it is

the therapeutic use of everyday life activities (occupations) with individuals or groups for the purpose of participation in roles and situations in home, school, workplace, community, and other settings. As defined by Turpin, Occupational Therapy is a science and an art whose primary professional activity is to alter environments to create changes in individuals' functioning [29]. OTs bring knowledge of disease, disability, the process of occupational analysis and engagement in occupation [3].

What do OT's do? "Occupational therapists and occupational therapy assistants are experts at analyzing the performance skills and patterns necessary for people to engage in their everyday activities in the context in which those activities and occupations occur." This expertise spans the life time of the person from childhood to the end of life, and the entirety of their interest or need to be "occupied" whether that is in play, learning, self care and family responsibilities, and especially for adults, in working [3].

The authors propose that trained occupational therapists provide a unique service based upon extensive expertise and are critical in work rehabilitation and ergonomics best practices. Their distinctive value is based on holistic training in both physical and psychosocial sciences, with strong emphasis on activity analysis, rehabilitation, the development of accommodations, and the dynamics of team building and negotiation skills through their training in group dynamics and organizational behavior. OT's unique level of expertise in physical, mental health and cognitive/perceptual medical conditions is a valuable contribution to the

*Corresponding author. E-mail: jacquecke@med.umich.edu.

building body of knowledge in evidence-based work rehabilitation and ergonomics best practices.

2. Scope of practice

Occupational therapy services are provided for the purpose of promoting health and wellness, and with those who have or are at risk for developing an illness, injury, disease, disorder, condition, impairment, disability, activity limitation, or participation restriction. Occupational therapy addresses the physical, cognitive, psychosocial, sensory, and other aspects of performance in a variety of contexts to support engagement in everyday life activities that affect health, well-being, and quality of life" [3]. The process includes evaluating, intervening, and targeting outcomes. Goals include the client's occupational performance, role competence and adaptation, health and wellness, quality of life and satisfaction, and prevention initiatives [3].

The practice of occupational therapy includes establishment, remediation, or restoration of a skill or ability that has not yet developed or is impaired, compensation, modification, or adaptation of activity or environment to enhance performance, maintenance and enhancement of capabilities without which performance in everyday life activities would decline, health promotion and wellness to enable or enhance performance in everyday life activities and prevention of barriers to performance, including disability prevention [3].

Evaluation includes client factors such as body functions (e.g., neuromuscular, sensory, visual, perceptual, cognitive) and body structures (e.g., cardiovascular), habits, routines, roles, and behavior patterns, cultural, physical, environmental, social, and spiritual contexts and activity demands that affect performance and performance skills, including motor, process, and communication/interaction skills [5].

Interventions include development, remediation, or compensation of physical, cognitive, neuromuscular, sensory functions, and behavioral skills. Additional foci are education and training of individuals, care coordination, case management, transition services, and consultative services. OTs are skilled in modification of environments and adaptation of processes, including the application of ergonomic principles. Their expertise includes assessment, design, fabrication, application, fitting, and training in assistive technology, adaptive devices and techniques to enhance functional mobility, and to enhance sensory, perceptual, and cognitive processing. The goal is to enhance the client's performance skills [4].

3. Education and certification requirements

To practice as an occupational therapist, the individual must have graduated from an occupational therapy program accredited by the Accreditation Council for Occupational Therapy Education (ACOTE®) or predecessor organizations, and must have successfully completed a period of supervised fieldwork experience required by the recognized educational institution. [5]. In addition, the practitioner must have successfully passed the national certification examination for occupational therapists and/or met state requirements for licensure/registration. Foreign educated graduates of occupational therapy programs approved by the World Federation of Occupational therapy (WFOT) may also be eligible for certification/licensure as an occupational therapist provided additional requirements are met [14].

4. Importance of and opportunities for collaboration

Best practices in both rehabilitation and ergonomics emphasize the benefits of teamwork, empowerment of those involved in the process and the importance of collaboration. Occupational therapists, as facilitators of successful functional capacities for persons of all ages, are skilled in enhancing team work and collaborating with other professionals who might also address rehabilitation and ergonomics, such as physical therapists and engineers. The American Occupational Therapy Association (AOTA) and the American Physical Therapy Association (APTA) offer detailed guidelines for the roles of their respective disciplines [8]. Barrows noted that OT's role in rehabilitation of persons with a psychiatric diagnosis may involve collaboration with other agencies such as vocational rehabilitation agencies to assist the client in achieving his employment goal [6].

Within and independent of collaboration, OT training prepares the therapist for conceptualizing and measuring the needs of both the individual and the setting within which they work. The OT curriculum and training focuses on the knowledge and understanding of human behavior, the role of sociocultural, socioeconomic, diversity factors, and lifestyle choices in contemporary society. The student's are trained to appreciate the influence of social conditions and the ethical context in which humans choose and engage in occupations, and in the ability to use statistics, tests, and measurements [1].

5. OT in work rehabilitation

As clinically trained medical professionals, OTs are skilled in Work Rehabilitation, which is a structured program of graded physical conditioning/strengthening exercises and functional tasks in conjunction with real or simulated job activities. Treatment is designed to improve the individual's cardiopulmonary, neuromusculoskeletal (strength, endurance, movement, flexibility, stability, and motor control) functions, biomechanical/human performance levels, and psychosocial aspects as they relate to the demands of work. Occupational therapists use work-related activities in the assessment, treatment, and management of individuals whose ability to function in a work environment has been impaired by physical, emotional, or developmental illness or injury. Work rehabilitation provides a transition between acute care and return to work while addressing the issues of safety, physical tolerances, work behaviors, and functional abilities [12].

According to the AOTA, major goals of work rehabilitation are to develop physical tolerance for work (including flexibility, strength, and endurance), to develop safe job performance, to prevent re-injury, to develop and reinforce appropriate work behaviors, and to determine if tool or job site modifications, ergonomics, or assistive technology will remove barriers to return to work.

In the area of industrial rehabilitation, occupational therapy practitioners perform physical capacity evaluations for workers' compensation cases, develop accurate job descriptions, perform objective job analysis, provide work conditioning and on-site therapy services, and identify reasonable accommodations to achieve a successful job match [7].

Industrial rehabilitation often focuses on musculoskeletal disorders (MSDs) such as repetitive strain injury (RSI), and cumulative trauma disorder (CTD), terms that describe the mechanism of an injury, and demonstrate the relationships between work rehabilitation and ergonomics. While sometimes considered a relatively new phenomenon, RSI's and CTDs have a long history in work rehabilitation. As an example, De-Quervain's disease, which is tendon pain at the thumb and wrist from overuse, dates back to the 1890's, when it was referred to as "washerwoman's sprain" [28]. New examples of MSDs continue to arise despite technological advances. In the 1980's, a new syndrome was named Nintendo thumb as a result of repeated use of the thumb and forward neck posture while using game controls, and is now associated with the use of

cell phones and portable digital assistants such as email devices.

While physical trauma is often the concern in treatment of MSDs, the involvement of mental health issues within the experience of physical pain is increasingly appreciated. Research conducted at Temple University has shown that RSIs can lead to chronic pain, malaise and mild depression, thus producing an effect that goes well beyond wrist and thumb pain (Raymond, I. 2005, November 3). Research notes that repetitive motion could lead to "sick worker" syndrome which is caused by the early effects of nerve damage. It is often mistaken for poor job performance, as the worker may reduce their production due to the psychological effects of the damage, perhaps the body's way of slowing down to allow the tissue time to heal [25].

The importance of expertise to treat these psychosocial issues is also increasingly recognized. OT's extensive training in both the physical and psychological aspects of health, disability and life skills offers a valuable perspective that other professions lack. The importance of focusing in both the physical and the psychiatric arena is reinforced through multiple studies on pain, functional capacity evaluations, work rehabilitation and ergonomics. Sang and Eria, in their study of work hardening with clients who had no diagnosed mental illness, recommended follow-up studies on the psychosocial aspects of worker rehab [24].

An important part of industrial and work rehabilitation for physical and psychiatric issues is reaching a win-win outcome for the employer and employee, requiring a focus beyond basic ergonomics. Rosenblum noted that the United States is far ahead of other countries in addressing MSDs through ergonomics, however with the aging of the population, it is also important to emphasize employee participation in health and wellness programs to meet job demands requiring strength and agility. In order to optimize performance addressing the ergonomic and psychosocial aspects, it is important to match employee capacities to job requirements [18]. Those work needs encompass more than just the physical abilities, but also interpersonal skills, decision making, problem solving, attention, concentration and other cognitive, perceptual and psychosocial skills associated with the employee's state of mind as well as their body.

According to the National Institute of Mental Health, symptoms of depression or prolonged stress at work include chronic aches or pains; which are frequently the presenting symptom of ergonomic interventions [11].

Geisser et al. found that psychosocial factors influence the measure of sincerity of effort obtained through

Functional Capacity Evaluations (FCEs), testing that is often used in work rehabilitation. Primary issues that merit exploration are fear related to functional activity and pain, self-efficacy and illness behavior. They recommend that FCEs include examination of psychosocial contributors and possibly "interventions aimed at reducing maladaptive psychosocial influences" [17].

In general, an FCE is designed to provide objective data about an employee's physical abilities. However, FCEs can also identify vital information beyond physical performance including cognitive processing skills, such as organizing space and objects, and the psychosocial issues that affect a successful return to work. The occupational therapist is able to gauge the employee's social, emotional, and cognitive responses and provide helpful coping skills or make recommendations for further treatment with a qualified health professional [17].

Miller, noted that "Each year, more than a half a million workers in the United States incur injuries or illnesses that result in disability for at least three to six months. Almost half of these individuals never return to work. For the half that does return to work, the focus generally is on the injured employee's ability to perform the physical and essential functions of the job. Psychosocial issues, such as depression, adjustment disorder, or stress can be factors that compound the length of lost workdays and can render the return-to-work process particularly difficult. And yet psychosocial issues may be largely overlooked or not addressed at all. Occupational therapists can contribute significantly to the evaluation, intervention, and case management process by recognizing psychosocial symptoms and their effect on the employee. Understanding these issues and knowing what resources to provide an injured employee can mean the difference between a positive and successful return-to-work experience for that person versus no return to work at all." [17].

Employees returning to a job following an injury experience some level of adjustment which may be described as a reaction to a stressful change. Miller noted that "It is estimated that one quarter of people can handle stressful change without losing productivity, and that about fifty percent can adjust to stressful change within a few weeks. The remaining twenty five percent often experience continuing difficulties that may lead to clinical depression. Left untreated, this population will contribute to the rising cost of workers' compensation claims by causing a loss in productivity and absenteeism." [17].

Work rehabilitation reaches beyond the basic "industrial" program focus of strength and conditioning in-

to the lives of those with complex medical conditions. Linda Irwin, PhD, a clinical psychologist at Glendale Adventist Medical Center in Southern California, identifies self-esteem and motivation as important indicators in a person's ability to successfully return to work following an injury. She adds that "those who suffer injuries resulting in visual, auditory, or linguistic impairment or paraplegia, head trauma, and disfigurement may be among the most vulnerable of employees who return to work following an injury-if they return at all." [30]. The OT training in accommodation development and adjustment to disability related to the physical, sensory, and cognitive/perceptual systems are unique and valuable in the rehabilitation process for these workers.

Braveman and Kielhofner noted that employment is a major obstacle for many persons with disabilities. In 2000 the US Census Bureau estimated that only 56.6% of Americans with disabilities were employed, compared to 77.2% of Americans without disabilities [13]. Financial risks are often noted as a concern by those in the role of hiring persons with disabilities, however according to the Job Accommodation Network, most accommodations for employees with disabilities cost less than \$500 but lead to return on investment of \$5000 [16]. The OT's expertise in medical and accommodation issues, as well as psychological adjustment to disability, workplace practices, related legal issues such as the ADA, and training in group dynamics, can facilitate an approach to work rehabilitation resulting in a win-win outcome for employers and employees who have a disability or medical restrictions within which they can work.

6. Occupational Therapy in ergonomics

Specific attention to psychosocial aspects of work is also important to injury prevention programs including proactive ergonomics. Melnik noted that "Employees' attitudes are one factor you can't overlook in the development of a successful injury prevention process". He addressed how attitudes affect the success of the return-to-work process or the development of an injury prevention program [2].

Given that Occupational Therapy's goal through injury prevention services is to promote the health and safety of the workforce, OT's expertise has a direct application in ergonomics by minimizing employee exposures to risk factors for musculoskeletal disorders (MSDs). Occupational therapists performing ergonomic in-

terventions utilize a variety of measuring devices, image recording equipment, symptom surveys, and nationally standardized tools to measure and analyze potential risks to the work force. The data acquired can then be applied directly and indirectly in administrative improvements (e.g. increasing the variety of physical exertions assigned to an employee via job enlargement), engineering controls (workstation or tool redesign), and work behaviors (training and education of employees to reinforce use of recommended techniques and postures). Often the OT collaborates with the worksite management, the employees, union and insurance representatives, worksite maintenance specialists and engineers.

The OT providing best practices for MSD prevention will typically have advanced training in ergonomics, supplementing their academic training in medical diagnoses, activity analysis and accommodations/universal design, as well as the social, emotional, analytical components of work and the influence it has upon the healing process of the human body. This understanding enables the occupational therapist to identify work processes that place excessive stress on the cognitive, psychosocial, and physical capacity of the worker. It is the combination of both the physical and psychological domains of human performance that the occupational therapist brings to ergonomic assessment and intervention. This expertise makes occupational therapy uniquely qualified to span the gap between the purely engineered systems of work and the purely biomedical-based treatment of individuals. This knowledge base enables occupational therapy services to have a positive impact on production, quality, and safety in the work place [31].

7. Occupational Therapy and injury prevention

Historically, Occupational Therapy has focused on prevention of disability, removal of environmental barriers and the use of adaptive equipment to ensure independence of occupational performance. As defined in the OT Practice Framework, strategies include, but are not limited to, Primary Prevention, which is targeting individuals without any limitations, Secondary Prevention, targeted to individuals at risk, and Tertiary Prevention, defined as limiting the consequences of an illness or injury. In addition, OT is active in Health Promotion, which empowers individuals to make better choices to improve their health, Education, which results in acquiring new skills, and Consultation, which provides

information to assist in re-designing a healthy lifestyle are alternative strategies to achieve a better quality of life [10]. Some of the desired outcomes of these interventions are self-efficacy, satisfaction, achievement and wellness [20].

The process of OT health and prevention services includes individuals with and without a disability. Health care changes demand a creative approach for clients and supportive partnerships with community agencies. OT services have evolved over time from a medical model to a community-based model of delivery and have expanded this role with strong clinical reasoning and professional research skills. In the age of technology, the commitment to client-centered assessment and intervention requires a broad knowledge base. The OT holistic approach includes the client and their culture, environment, roles in life, and personal goals for outcome.

8. Readiness for change

As indicated in this paper, employee attitudes contribute to the success of an injury prevention program. Prochaska et al introduced a Stage of Change Model in occupational settings with a focus on the readiness to change. They proposed that employee attitudes and beliefs are dependent on management commitment, worker input and the motivation to change. This can be compared to the OT Client-Centered Model which emphasizes client inclusion in the evaluation and interventions. Transferred to work services practice, this model resembles and supports the employer inclusion of the workers in an ergonomics program for a successful outcome [20].

9. Tools for measuring risk factors and the effectiveness of preventing work injuries

OTs providing best practices require the use of tools to standardize and objectify the approach to injury prevention services. An effective evaluation used by OTs for measuring injury prevention outcomes is the Quality of Life Survey Tool, developed by the Centers for Disease Control and Prevention. It includes both physical and mental health components for perceived meaning and purpose in life. In addition, ergonomic risk factor identification includes several tools, such as worker surveys, injury data and lost work time information, behavioral and work-site observations as well as work-

place audits in order to have useful methods of measurement [26]. Effective worker health surveys include components of Health Related Theories. Consistent with OT's focus on the employee physical and psychosocial health, A General Perceived Self-Efficacy Scale (GPSE) can assess beliefs about performing certain health behaviors; and predict methods of coping with personal quality of life management, self-regulation and goal attainment [23].

Informal tools, such as a worker survey, can be helpful to explore perceived injury, potential obstacles for a safe work environment, and solutions for existing risk factors in the job tasks. This information offers further insight into the psycho-social realm of the workers, management/worker relationships and worker/worker relationships. The reported barriers to a safe work environment assist in justifying engineering and/or administrative controls. Identification of body part discomfort can be directly related to the physical demands of the essential job functions.

When reviewing injury data, an important part of prioritizing and goal setting in injury prevention is considering the reliability of lost time injury rate data. "OSHA logs only capture 60% of reportable injuries." [23]. The outcomes of injury prevention services may be due to the intervention or simply random increase or decrease of injuries, therefore skilled OTs use multiple outcome measures to review the effectiveness of an intervention. This can offset one of the greatest concerns of biases; that some companies encourage over-reporting of work related injuries while others may offer incentives to minimize injuries and encourage under reporting [30].

10. A blueprint for success: A participative ergonomic model

Best practices typically look to effective models developed through research. Injury prevention services provided by occupational therapists through ergonomics merits this consideration. Looking at one model, developed by Wells et al. [30], called Participative Ergonomic Blueprint, the health and safety process includes both the reactive and the proactive components, offering the ability to address the needs of both medical concerns and injury prevention. The Reactive Ergonomic Process includes identification of opportunities for improvement; assessment of ergonomic risk factors and prioritizing jobs for improvement, implementation and evaluation of controls. The Proactive Ergonomic Process includes using feedback from previ-

ous designs and integration of ergonomic design criteria and purchasing guidelines. The success of this model is based on management support, forming an ergonomic team and training. The combination of the Reactive and Proactive processes facilitates an ergonomic program that can address a holistic approach to maintaining a safe work environment [30]. An active safety committee that has departmental representatives from all shifts, safety rounds with management/selected workers/supervisors, as well as ongoing education/training for employees, are all mandatory pieces of a well functioning Health and Safety Program. Customized ergonomic programs, although labor intensive, involve employee input and empowerment. Utilizing pictures and videos of the specific jobs, equipment, tools, and workers, facilitates better ergonomic awareness, hands on demonstration and a higher level of application to each job task.

Several authors have written about Participative Ergonomics and the successful outcomes with worker inclusion as part of the whole process. This approach builds trust, ownership and subsequent commitment to targeted solutions or controls. Some of the rewards that result from this philosophy are better communication, increased knowledge base of ergonomics with the employees and greater potential for sustainability. A quote from one study states "... success of ergonomic interventions depends not only on the efficacy of a given change in work practices in reducing musculoskeletal risk, but also on the willingness of workers and employers to utilize new work practices in the field" [21]. This emphasis on worker inclusion in prevention services is in direct agreement with the previously mentioned OT Client-Centered Model, which emphasizes client inclusion in the evaluation and interventions.

11. History and Future of OT in work rehabilitation and ergonomics; Applying best practices

11.1. The evolution of the University of Michigan OT work programs

"In every conceivable manner, the family is the link to our past, bridge to our future" Alex Haley

Reviewing the history of Occupational Therapy allows an exploration of the evolution of the knowledge base, practice models and best practices, enabling an examination of a program design for both work reha-

bilitation and ergonomics. To explore this history, the authors conducted an interview with Lyla Spelbring, a retired leader in both Occupational Therapy and its practice at the University of Michigan Hospitals. From her understanding and a review of historical references, it became evident that OT's role initially developed based on patients' needs and desires to be "occupied" in meaningful activity while in the hospital, and their interests to work, and to have a good quality of life.

The profession's rich history dates back to 1904, when it was initiated by doctors in "insane hospitals" who put their patients to work as an experiment in their care, and by doctors of patients with chronic fatigue and weakness who wanted to give them a healthy interest in life. In Michigan, Occupational Therapy began at the Battle Creek Sanitarium in 1915, under the leadership of Dr. Herbert J. Hall and Dr. John Kellogg. The main focus during this time was the use of crafts to assist in the healing process. In 1918, World War I produced a need for rehabilitation of the injured soldiers in France. The OT practitioners, called "civilian aids", worked side by side with the soldiers. This work resulted in the birth of vocational re-education and training, demanding a combination of skills in developmental psychology, mental health and social welfare. The primary goal was to return the client to active life, for the person to take control of their situation, to promote and hasten their return to function.

In the Depression years of the 1930's-post WWII (1949), OT progressed to its focus on "work, occupation, activity, normalcy, stimulation of mind, function, health and adjustment." Advancements included development of accredited training programs and development of standards for training and school inspection. In 1945, Marian Spears, helped establish an OT curriculum at Western Michigan University, located in Kalamazoo, Michigan. Persons served had various physical and psychiatric diagnoses: "cardiac conditions, cerebral palsy, psychiatric illnesses, poliomyelitis, tuberculosis." Treatments included industrial rehabilitation and reconditioning of military personnel. Concurrently, the medical professions experienced the emergence of Physical Medicine and Rehabilitation, OT differentiation from PT, neuropsychiatry development, pediatric practice expansion and psychiatric theory advancement (e.g. Freud, etc.).

More recently, work rehabilitation programs become part of the occupational health process, coordinated as part of the employee's pursuit of maximum medical improvement, then return to work or an interim rehabilitation program of evaluation, goal-directed therapy and

unrestricted or gradual return to work. In a more consultative role to medical providers and businesses, the occupational therapist may provide one time work site assessments regarding the match of job demands to an employee's capacities, accommodations needed to perform job duties with restrictions, and negotiations with the employer, union representatives, insurance companies and others for return to work. An interim process may be participation in a preparatory work hardening program at or away from the worksite. The importance of collaboration with others, such as employers, case managers and vocational rehabilitation counselors is critical to the successful win-win work rehabilitation resolution. Injury prevention services have also evolved, often provided in collaboration with the employer's occupational health and insurance providers in an as-needed consultative role.

To illustrate OT's evolution and importance in Work Rehabilitation and Ergonomics, the authors offer an example of University of Michigan's OT program's evolution from a Medical/Clinical Based model to a Community Based and its current Occupational Health Consultation Model.

11.2. Medical/Clinical Hospital-Based OT Work Program (1922–1989)

Occupational therapists joined together and formed the National Society for the Promotion of Occupational Therapy (NSPOT) in 1917. In 1921 it was renamed The American Occupational Therapy Association (AOTA), adding to the visibility and relevance of OT in the hospitals which followed the Industrial Rehabilitation Act of 1920. The University of Michigan Medical Center OT Program began in 1922. The program was initially administered within the Social Work Department and was considered a basic service for the hospital at no charge for the patients. In 1925, OT was provided in small work rooms on each patient floor, with the departmental offices on the lowest level of the newly built hospital. Since OT did not yet have University-based degree programs, OT students were trained to be therapists at the hospital until the mid 1930's. Patients included those with physical and/or psychiatric illnesses/injuries, with treatment using functional activities like arts and crafts to "occupy" those in rehabilitation, with the desired outcome of helping them to return to a productive life in the community. The work program focused on pre-vocational activities, such as working with wood in the woodshop, weaving and needlepoint.

OT was later positioned under Physical Medicine & Rehabilitation (PM&R) and transitioned to a medical model, incorporating gradual reduction in use of crafts and activities, replaced with a focus on activities towards measurable capacities such as range of motion and strength. The first OT work rehabilitation position was paid for by the Michigan Department of Vocational Rehabilitation. This close relationship, with what is now called Michigan Rehabilitation Services, continues to fund OT Work Program services for clients who have personal medical conditions not covered by workers compensation or auto insurance.

In the mid 60's, work samples and standardized assessments were developed and utilized in the hospital for what was primarily a pre-vocational focus and included rare contact with patients' employers. OT treatment focused on rehabilitation of the whole person at home, community and at work. Functional Capacity Evaluations (FCEs) began to be objective and norm-based with the availability of standardized work samples (e.g. Bennett Hand Tool, Valpar Component Work Samples, etc.), and simulation of work duties. The OT's began development of worksite services including development of accommodations, job trials and on-the-job coaching. During this time, OT provided limited clinic based work hardening but did begin to therapeutically design volunteer placements as job trials since most employers required that employees return to work full duty.

"Ergonomics" was not yet a common term, nor was the typical industrial employer reaching out for help to reduce injury rates. The OT Dept had no population-based injury prevention ergonomic services. This pre-Americans with Disabilities Act (ADA) time frame offered those with disabilities few opportunities for employment.

11.3. Community based OT Work Program: The Center for Occupational Rehabilitation and Health (Renamed Work Wise): 1989-1999

In 1989, the expansion of the PM&R approach to work rehabilitation resulted in a move to a community based outpatient service for clients having physical and psychiatric diagnoses, and often complex medical challenges that were previously addressed while on inpatient status. The OT Work Rehabilitation services included a customized FCE and a robust clinic based work hardening program, job accommodations, worksite consultations and job coaching, and ADA consultations. Employers were increasing their desire to assist

employees with return to work based on the ADA, expanding options for OT negotiations and implementation of reasonable accommodations for employees with disabilities.

The scope of the community-based OT Work Program expanded consultation services with outside companies and a focus on industrial manufacturing employers, incorporating the growing science of ergonomics. Services also expanded within UM hospital and academic departments to include proactive education and training for injury prevention. A growing focus emerged on musculoskeletal disorders at worksites, use of state of the art measuring tools, and training, job design and equipment changes to match the work to the worker. As part of the University environment, the OTs partnered with the Center for Ergonomics, combining the skills of OT and engineers. The roles were mutually supportive, with the engineers initially involved with company through implementing major equipment modifications and the OTs later engaged to provide training and on site job coaching.

11.4. Occupational Health consultation model

In 1999, UM consolidated work services and relocated the OT Work Program within the occupational health department's disability management program, partnering OT with occupational health physicians and nurse case management. This client centered approach included a transition from a rehabilitation focus (restoring optimal overall function), to a business consultation model (focused on efficient services focused on a specific diagnostic issue and its effect on work production). Services continued to be provided for both University of Michigan and external employers in work rehabilitation and injury prevention.

The transition omitted clinic based work hardening coupled with increased employer openness to provide gradual return to work at job sites to reduce their own compensation costs. For clients needing conditioning and more extensive preparation for employment outside of work, The OT Work Program expanded its community-based "Bridge to Work" program. This is a therapist-designed and monitored graded, goal-directed volunteer activity at UM or in the community for clients who can not do so on the job. OT Work Programs continued to provide FCEs, job coaching, ADA consultations for person having any physical or psychiatric diagnosis.

This business-consultation model provided a more concise therapeutic approach serving UM employees,

often in cooperation with nurse case managers. OTs provided on site work assessments, training, education, accommodations, and guidance to resolve diagnostic-specific employment issues for persons with an MSD. Injury prevention services included education and training for UM departments and individual consultations. For clients having other complex medical challenges (e.g. neurological, cognitive, psychiatric) beyond the focus of ergonomics, a holistic rehabilitation approach continued, involving home, community and family as needed to maximize the client's employability. The program continued a strong relationship with Michigan Rehabilitation Services for clients without workers compensation or automobile insurance coverage.

Comprehensive services continued to employers outside of UM, including injury prevention consultations and educational programs related to ergonomics and other employment issues, as well as worksite assessments and accommodations for persons with any type of medical diagnosis. These programs were customized to meet the needs of the multiple customers involved: the identified employee or group, the business owner/managers, unions, payors and others.

OT proactive ergonomic services later expanded within UM through increased support from Employee Health and Safety Departments. Campus and health system services for most departments became subsidized, overcoming the previously challenging fee for service requirements. Through this effort, improved injury prevention services developed, autonomously provided on three campuses and within the health system. However these programs and resources were not interrelated, struggled for a cohesive and effective way to reach the population of almost 40,000 faculty and staff, and could not address the challenge of employees with a medical condition continuing to need a financial resource to fund their need for a customized approach.

12. 2005 Enhanced Ergonomic Services within UM

12.1. New Program: Comprehensive Ergonomic Services within UM

In 2005, a major improvement enhanced access to both customized and prevention services related to MSDs for UM faculty and staff through the development of the Michigan Healthy Community (MHC) and its Ergonomic Awareness Program. The Michigan Healthy Community Initiative (MHCI) was established by UM President Mary Sue Coleman to promote the employ-

ee health management of the University of Michigan community, to develop more cost-effective delivery of health care as a model for other institutions, and to advance public discussion and social commitment to change in this area.

Through MHC, the UM leadership supports and facilitates a robust ergonomics program through the development of a collaborative team including all of the work rehabilitation and ergonomic injury prevention providers. The team is comprised of two thirds occupational therapists, one third health and safety personnel, and consults with occupational health medical care providers, engineers and the UM risk management department. The OTs provide team leadership, almost all of the injury prevention education and consultation services and provide 100% of the customized "medical" consultations for employees under a doctor's care for MSD discomfort at work. These employees are not considered to have compensable issues through workers compensation. The program provides new funds for an OT assigned to serve employees through the Ergonomic Awareness Program, no longer needing to charge departments for the customized consultations nor for injury prevention services to some UM departments previously under a fee for service model. The OTs all work closely with the UM department, employees, and campus health and safety staff. While the OT time is funded, the departments remain the financial resource for recommended equipment.

The MHC process also significantly enhances the ergonomic service providers' collaboration with UM health and wellness programs (e.g. healthy eating, physical activity, mental health, etc.) as well as communication professionals to help design and distribute the educational messages for enhanced self care and risk reduction throughout the UM faculty and staff. The ergonomics team has developed web-based learning tools (see website at www.mhealthy.umich.edu) as well as posters and handouts that are mailed directly to UM employees and departments. Risk reduction through engineering changes has improved through MHC-provided funds that the ergonomics team disburses through new programs of competitive grants and awards given to departments. The team is expanding population-based injury prevention collaboration, through discussions and cooperative efforts with design and procurement departments.

Initial outcomes are very encouraging, with staff reporting a decrease in MSD-related lost work time, and increased comfort, production, and job satisfaction. Injury and medical cost data outcomes will be further

reviewed over the next few years to study trends regarding the impact of the Michigan Healthy Community Programs, including Ergonomics Awareness, in collaboration with its partners in employee health and wellness.

13. The future

Changes in the workforce will continue to affect how employees with injuries experience their work and other life roles, how the employer deals with related productivity challenges, and best practices in the return to work and injury prevention processes. Trends such as the decreasing numbers of skilled workers and manufacturing jobs, increasing use of temporary workers and technical jobs, the emergence of the aging workforce, and an increasingly diverse labor market are all affecting work rehabilitation and injury prevention services. Many governmental and independent agencies, such as the Occupational Safety and Health Administration (OSHA) and the National Institute for Occupational Safety and Health (NIOSH), are working on proactively adjusting guidelines, initiatives, and protocols to address new and changing focus areas [15].

The needed changes in service provision include an expanded focus on understanding the psychosocial aspects of behavior change. For example, Nieuwenhuijsen noted that self-efficacy and perceived health status combined with intention was most significantly related to health behavior change [19].

Stanfor and Milchus noted the current major emphasis in research based on practice situations, and a need for further controlled studies to ensure that best practices are research-supported [27]. The authors agree with the importance for OT to continue its development of a strong evidence-based practice model. While clinical practitioners often have a full schedule of clients and a growing need of the aging workforce that will benefit from help, it is likely to take further collaborations among clinicians and academics to develop this fund of knowledge. The authors recommend development of those partnerships, encouraging masters and PhD level students to incorporate these investigations into their requirements for achieving an advanced degree to explore and enhance OTs important role in work rehabilitation and ergonomics.

Acknowledgements

The authors wish to thank Karen Jacobs for the encouragement to develop this Sounding Board and the following friends and colleagues, for their assistance and contributions to this paper: Leslie Kamil, JD, OTR; Ruth Lamphiear, OTR; Debra Lindstrom-Hazel, PhD, OTR; Els Nieuwenhuijsen, PhD, MPH, OTR; Lyla M. Spelbring, PhD, OTR/Ret, FAOTA.

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