

 **EXTRAORDINARY
ERGONOMICS:**

**Risk Management Strategies for
Optimal Cost Savings**

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 **Learning Objectives**


1. Define ergonomics effectively.
2. Differentiate the 4 different types of work injury drivers.
3. Discuss Ergonomics as a quality business process.
4. Recognize 4 different levels of ergonomic analysis, who is qualified to perform and their value to the process.
5. Explore various ergonomics process models and the Return on Investment that results from implementation.

 **Define Ergonomics**

Ergonomics Is...

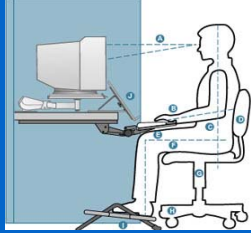
- The laws of work
- Human and machine interface
- The relationship between the human and the work environment, the tools and materials handled and the tasks performed




 **Define Ergonomics**


Ergonomics is...

- Injury prevention and management of MSDs
- Productivity improvement
- A change process
- A quality business process




 **The Drivers of Work Injury**

- Organizational
- Cost
- Ergonomic Risk Factors
- Personal Factors

 **The Organizational Drivers Of Work Injury**

- Organizational Culture
- Work pressures
- Lack of control
- Repetitiveness of work
- Stress: short and long term
 - Budgets
 - Downsize and layoffs
- Supervisor/employee relationship
- Productivity monitoring



The Cost Drivers of Work Injury

- Direct costs
 - Medical expenses
 - Temporary disability
 - Permanent disability
 - Attorney
- Indirect costs
 - Poor decision making
 - Replacement fees
 - Temporary workers
 - Retraining workers
 - Lost productivity
 - Lost revenues
 - Errors, Delays

State Average for WC Claims is about \$45,000.00 with Lost Time


Understand the Ergonomic Drivers

- Repetitive motion
- Forceful exertions
- Static postures
- Awkward postures
- Contact stress
- Vibration
- Cold exposure

Personal Factors


Compliance Driver

- Title 8 Subchapter 7. General Industry Safety Order Group 15. Occupational Noise Article 106. Ergonomics §5110. Repetitive Motion Injuries
- Since July 1997
- Only State with ergonomic regulation
- Requires all employers comply if more than one RMI occurs and is
 - predominantly caused by a repetitive task;
 - identical work activity;
 - has been objectively diagnosed by a Dr;
 - occurred within 12 months of each.
- Analysis, Hazard Prevention and Training




Ergonomics as a Quality Business Process

- Based on Hendrick and Kleiner theory of "Macroergonomics"
- Focuses on "design of the overall work system".
- A top-down sociotechnical systems approach to the design of work systems that carry through to the human-machine–software interfaces
- Ensures entire work system is fully harmonized




The Ergonomics "Process" Foundation

- Hendrick: a series of steps that convert inputs to outputs in a system
- Imada and Noro: Includes a participatory approach to involve employees in the analysis and design of their work environments and activities.
- Deming: Denotes continuous improvement
- All steps or stages work together toward quality that the ultimate "customer" will boast about.



Process Characteristics


- **Flow**: the methods of transforming input into output
- **Effectiveness**: How well customer expectations are met or **QUALITY**
- **Efficiency**: How well resources are used to produce an output or **PRODUCTIVITY**
- **Cycle time**: the time taken for the transformation from input to final output
- **Cost**: the expense of the entire process



PROCESS MEASURES


Measurements are key...
"If you can't measure it, you cannot control it. If you can't control it, you can't manage it. If you can't manage it, you cannot improve it. "

H. James Harrington, "Business Process Improvement", 2001, McGraw-Hill




BUSINESS PROCESS MEASURES

- EFFECTIVENESS
 - % of evals scheduled in a timely manner
 - % of reports completed in the time allocated
- EFFICIENCY:
 - Recommendations made are appropriate
 - Recommendations are not wasteful
 - The time from site visit to implementation is in a timely manner
- ADAPTABILITY:
 - One size doesn't fit all
 - Recognize special needs
 - Moral obligation




The Ergonomics Process is...


- Lean, pro-active participative approach
- Driven by employee and management participation.
- Based on employee self-assessment to address concerns in a positive and preventive manner.
- A continuous improvement process
- Designed to address ergo issues in the office, healthcare, lab, industrial areas and other non-traditional jobs.


 **The Ergonomics Process is not...**

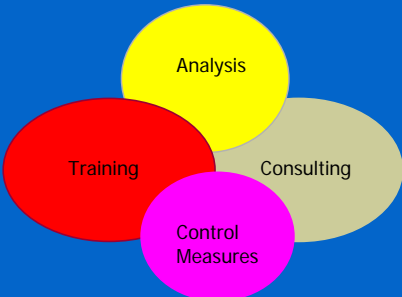
- A way to funnel off your need to upgrade your department facilities
- An office supply program
- An office decorating program
- A remodel budget
- A wish list of all the things an employee would like to have


 **Ergonomics Process**

- County of Monterey Ergonomics Process




 **Ergonomics Process Components**






Ergonomics Process Data

- Monitor symptoms and risk factors that can be reduced over time through interventions
- "Evidence- based", objective process
- Four levels of intervention are offered; each generates additional data (report).
- Track:
 - Participation
 - Timeliness of evaluations and report response
 - Timeliness of ordering recommendations
 - Timeliness to installation
 - Cost




Four Levels of Ergonomics Analysis

Self Assessment (online tool)	Prevention
Level I In-house Eval (In-house evaluators or Ergo Manager)	Prevention
Level II Medical Only Ergo Manager, Qualified HCP or 3 rd party	Reactive
Level III Lost Time Ergo Manager, Qualified HCP or 3 rd party	Reactive




Qualifications and Expectations of an Ergonomic Evaluator

- Level I Evaluator: On The Job Training
- Level II and III Evaluator:
 - University Degree: HFES, Engineering, PT, OR, RN, Industrial Psych
 - Continuing Education:
 - Private Label Certification: CEES, CEAS
 - University based
 - Board Certification
 - Oxford Research Institute: CAE, CIE www.oxfordresearch.org
 - Board of Certified Professional Ergonomists: CEA, CPE www.bcep.org



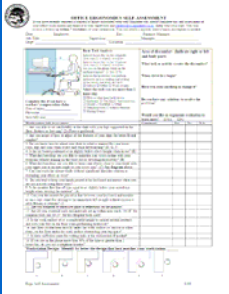
Expectations for a Quality Ergonomics Report

- Each level of evaluation offers a report of critical information:
- OSHA Compliance
 - Document ergonomic risk factor exposures : type and extent
 - Impact of work tools, equipment, furniture and environment on the employee
 - Discussion of findings
 - Various hazard prevention and control measures:
 - Engineering changes
 - Administrative actions
 - Purchases
 - Training and education
 - Time Indicators



Expectations for a Quality Ergonomics Report


- Self-Assessment:
 - Establishes a baseline by the employee
 - Entry point
- Level I:
 - Provided by in-house trained evaluator
 - Clarifies the problem;
 - Provides early intervention – quick fixes, education and safe work practices
 - Low cost recommendations






Expectations for a Quality Ergonomics Report


- Level II:
 - Provided by certified/qualified provider
 - Usually associated with symptoms or medical claim;
 - Biomechanical analysis, provides symptom management, additional work practice strategies
 - Low cost recommendations
- Level III:
 - Provided by certified/qualified provider
 - Complex injury and lost time; includes accommodation assessment to RTW
 - Level II components
 - More costly recommendations


 **Expectations for a Quality Ergonomics Report**

- All reports comply with HIPAA and other privacy laws by:
 - Excluding diagnosis
 - Focusing on discomfort associated with functional task
 - Using biomechanical analysis and identifying insufficiencies within the work area
 - Targeting specific recommendations to remedy the exposures identified


 **Employee Training**

- Taught by a qualified provider
 - Office Ergonomics – new hire, injured employees; quarterly
 - Back Safety/Material Handling- quarterly or less
 - Topical training
 - Custom onsite "brown bag" sessions: office/industrial
 - "Train the Evaluator" for in-house expertise
- Classroom style
- Online
- Handouts




 **Consulting**

- Job, process or task analysis that impacts more than 1 employee
- Custom process development
- Facility planning for new or existing office furniture re-org, renovation or relocation
- Assist and support your ergo team within your department




Hazard Prevention and Control Measures

- Administrative Actions: work pacing, task rotation, task interruption, behavioral changes (stretching and interruption software)
- Engineering Changes:
 - Ergonomic Product purchases including accessories, tools, furniture
 - Tool or process redesign
 - Workstation redesign




8 Cost Saving Strategies

1. Offer a pro-active, early reporting option.
2. Hold employees, managers and supervisors accountable to the process goals.
3. Implement control measures promptly.
4. Pre-select approved ergonomic furniture and accessories
5. Respond to non-occupational requests .
6. Obtain Physician approval on all Occ/Non-Occ interventions.
7. Push costs through claim whenever possible – evaluation and recommendations.
8. Offer a “Pay now or Pay Later” option.



Return on Investment

- In some cases, Risk Management will fund for prevention and workers' comp costs associated with the ergonomics process (preventive evals and w.c. claims).
- Each department's costs will be charged to the Internal Service Fund either as claim mitigation or claim management.
- Anticipate a ROI of \$6.50-15.90 for every dollar invested in injury prevention and early intervention.
- Anticipate Mo Co will save approximately \$1.0 million in 1-2 years with ongoing savings anticipated in the future.




Methods

- To determine the annual ROI, the following model is used:
- Formula A:


$$\frac{\text{Net annual change in all CTD injury/illness costs}}{\text{Annual investment in the ergonomics process}}$$
- Formula B :

$$\frac{\text{Average Company Workers' Compensation Costs per claim} \times \text{\# Prevented Evaluations performed}}{\text{Annual investment in the process}}$$




Successful Outcomes to Developing an Ergonomics Process

- Case #1: Ergonomics Task Force: Office
 - Public agency- 450 employees, office ergonomics
 - 7 member task force
 - 4 year outcomes
 - Formula A: ROI of \$2.14 for year 2, \$13.00 for year 3, and year 4 \$5.50.
- Case #2: Preventive Office Ergonomic Analysis
 - Private business- 75 employees, office ergonomics
 - 1 year outcomes
 - Formula B: Demonstrated ROI of \$10.66 for every \$1.00 invested.



Preliminary Outcomes For MOCO Ergo Process


- Average days from employee notice to site visit:
 - <30 days +/- 10 days
- Average days from site visit to implementation:
 - Preventive 48.3 days
 - WC 68 days
- Top Departments:
 1. DSES
 2. Health
 3. Sheriff
 4. OET
 5. CSS



Preliminary Outcomes For MOCO Ergo Process

County of Monterey First Year (2008):
Budget \$160,000.00


- Number of employees evaluated: 141
 - Proactive/Preventive: 67 47.5%
 - WC claims: 74 52.5%
 - Ergonomics Manager: 85
 - 3rd Party Evaluators (3): 56
- Average cost/case:
 - Preventive Evals: \$345.00
 - Purchases: \$442.50 to \$492.00 (wc)



Preliminary Outcomes For MOCO Ergo Process ... Preventive

- Average cost medical only claim: \$3500.00
- Project 2/3 as med only claims: 44 cases
- Projected Costs: \$155,000.00
- Cost to eval 56 cases: \$19,320.00
- Cost of purchases: \$29,648.00
- Total Investment: \$48,968.00

TOTAL 1 Year SAVINGS: \$105,802.00



Preliminary Outcomes For MOCO Ergo Process ... Indemnity

- Average cost indemnity claim: \$45,000.00
- Project 1/3 less indemnity claims: 22
- Anticipated costs: \$990,000.00

Investment:

- Cost to evaluate: \$500.00
- Cost of purchases: \$492.00/case
- Total Investment: \$21,824.00


SAVINGS OF \$968,176.00



**PROJECTED TOTAL SAVINGS
FIRST YEAR....**

\$1.1 Million

As the result of preventing and managing 141 cases aggressively and effectively with ERGONOMICS!




USING FORMULA B

Average Company Workers' Compensation Costs per claim x # Prevented Evaluations performed
Annual investment in the process


\$1.1 MILLION in projected costs/claim
 \$70,792.00

ROI is \$15.00 for every dollar invested




Conclusion

- The more involved management and employees are in a participatory approach, the more robust the financial benefits will be.
- The more real the actual cost figures provided, the more accurate the financial analysis is for the employer further demonstrating that the investment is well worth the outcomes achieved.




Conclusion

- Establishing an Ergonomics Process is a commitment to drive change in the organization via a powerful business process resulting in significant improvement in employee health and safety demonstrating continuous ROI in years to come.



This session has...

1. Defined ergonomics effectively.
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4. Recognized 4 different levels of ergonomic analysis, who is qualified to perform and their value to the process.
5. Explored various ergonomics process models and the ROI from implementation.



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Risk Management Strategies for Optimal Cost Savings

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THANK YOU FOR YOUR ATTENDANCE!

SUCCESSFUL OUTCOMES OF AN ERGONOMICS PROCESS USING AN ERGONOMICS TASK FORCE

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With the first state ergonomics regulation in place and more on the way, employers are now being held accountable for ergonomic compliance. Employers are increasingly interested in realizing benefits with ergonomics, despite regulations. In this study, an ergonomics process is introduced which includes a participatory approach through the development of an Ergonomics Task Force. This participatory approach using labor and management to apply ergonomic principals demonstrates significant and substantial benefits for a variety of organizations from a public safety agency to an educational facility (2) to a banking entity, a hospital and a bio-technology firm. This study identifies the numerous ways that organizations are benefiting from an ergonomics process using an ergonomics task force as the source of in-house expertise.

INTRODUCTION

The problem of Cumulative Trauma Disorders in the workplace continues to plague business worldwide as a medical issue, a labor relations' issue and a regulatory concern. Significant progress has been made in the fight to reduce the number of repeated trauma cases. The Bureau of Labor Statistics is reporting a reduction in these claims for the 4th consecutive year (Workplace Ergonomics, 2000). In the most recent Bureau of Labor Statistics survey, disorders due to repeated trauma in 1998 accounted for 253,300 cases down by 8.4% in 1997 (CTDNEWS, 2000). Several factors are noted for influencing the recent reduction. Ergonomic regulations have moved into the international and national forefront (European Framework Directive, Fed-OSHA, California, Washington state and North Carolina). These regulations are attempts by government to further protect workers by improving working conditions and to reduce the financial and physical impact of CTDs and RMIs (repetitive motion injuries). However, they are not without substantial controversy. To date, the regulations take a broad approach encouraging management leadership along with employee participation, early reporting systems, worksite analysis, control measures and employee training.

Along with the drive to regulate ergonomics, the concepts of participation in safety and ergonomics have grown considerably over the past 10 years. This can be related to the general revival of interest in more participatory and behavioral management styles as opposed to traditional hierarchical, battlefield mentality. By definition, participatory ergonomics consists of stakeholders taking part in ergonomics initiative or sharing ergonomics knowledge and methods. The stakeholders include anyone affected by the process or changes and involve more than just the users or workers. Noro describes the initiative as a new technology to disseminate ergonomics information and also as a procedure whereby ergonomists work together with non-ergonomists on a company wide basis (Noro, 1991).

One of the most critical elements noted by Nagamachi, Imada and Lewis is the importance of involving the worker or end-user in the problem solving process and as an active participant to improve their working conditions and/or product quality. Wilson has identified ergonomics management programs at work, as "the involvement of people in planning and controlling a significant amount of their own activities, with sufficient knowledge and power to influence both processes and outcomes in order to achieve desirable goals" (Salvendy, 1997). Heibeker, et al. describes team processing as an optimal way to meld individuals with different talents and degrees of expertise to achieve critical organizational goals resulting in a "best practice" approach (Heibeker, 1998).

CTDs have become significantly more prevalent in the workplace, with many organizations over the last five years demonstrating an increased desire to take action in with or without regulations in place. Based on participatory ergonomics and team building concepts the ergonomics process includes developing an Ergonomics Task Force (ETF). In the process, the employees' responsibility is to report symptoms as part of an early identification program so that the ETF and the supervisor can address workstation analysis. An optional CTD medical screen for symptom assessment is available in some of the programs. If symptoms are rated moderate to high, medical management is implemented as needed with a physician referral (Heller, 1998). A summary of the process is presented below.

METHODS

This study involves a diverse group of industry participants including a public safety agency; a biotechnology company, a financial institution, a large hospital, and two

community colleges. All of the organizations have established an ETF as part of the ergonomics process. They were all trained the same core curriculum. Each entity has taken the process and geared it to meet it's own needs with excellent results early on extending through a 5 year period. Table 1 demonstrates the current status of each team.

The members were selected through special appointment or volunteering their time on the Task Force. The teams were established with 5 to 12 primary members and are to serve two main functions:

1.To bring together different levels of the organization, workers and management for the goal of decreasing work injury and increasing productivity through ergonomic change.

2.To serve as an advisory body with internal ergonomics expertise to assist in the prevention and management of work injury onsite.

Task Force	Start Date	Active	Turnover	ROI	Ongoing Support	Team #
College	Nov-97	Yes	Yes	No	Yes	7
Hospital	Oct-99	Yes	No	No	Yes	12
Bank	Apr-99	Yes	Yes	Yes	Yes	7
Bio-Tech	Aug-99	Yes	No	No	Yes	10
Sheriff	Mar-94	Yes	Yes	Yes	Yes	5
College	Nov-98	Yes	Yes	No	Yes	10

Table 1. Status of each team in the study.

Role Designations

The Ergonomics Task Force is composed of the following designated positions (Heller, 1998):

1. ETF Program Director: An upper management position that supports, promotes and defends the underlying concepts of the Ergonomics Process by overseeing all operations related to the goals and implementation of the Ergonomics process.

2. ETF Chairperson: A middle management position that deals with day to day operation by moderating ETF meetings; acts as liaison between management and the committee; makes assignments to committee members and confirms completion of the assignments; coordinates committee activities with the affected personnel by tracking training issues; purchases and disability management of employees with CTD problems.

3. ETF Surveyors (2 or more): Responds to any Ergonomic Evaluation Request Form to determine the cause of the concern through the use of the ergonomic analysis system. Performs an interview for history taking followed by an inspection or site analysis of the work area or workstation to identify unsafe work practices or procedures and general concerns related to known ergonomic hazards and risks. Educates the employee/supervisor of any serious safety or ergonomic hazards so corrective action can be taken at the time

of the site visit or as soon as possible. Assists the ETF and management in complying with all applicable controls and recommendations, including follow-up.

4. ETF Procurement Coordinator: Responds to the Ergonomic Equipment Purchase Request by coordinating the purchasing and dissemination of recommended furniture, equipment and tools or accessories. Monitors costs associated with ergonomic equipment purchases. Communicates with ETF Chairperson to inform them of purchase status for each case.

5. ETF Training Coordinator: Coordinates the development (and implementation) of specific training programs that pertain to CTDs and ergonomics, assures that training programs are scheduled for affected employees and new hires.

6. ETF Secretary: Assists the ETF Chairperson by preparing and disseminating reports including meeting reminders, agendas, takes minutes of the meetings, and documents activities of the ETF.

7. ETF Maintenance: Installs, repairs, retrofits and assists with the moving and maintenance of office/industrial equipment as it pertains to improving workstation design and minimizing identified hazards.

Program Components

Each ETF underwent 13 to 24 hours of basic ergonomics training (by the author) as well as a refresher class during year 2 and 3 for the Sheriff's department. Start-up training included how to perform an office, laboratory or material handling ergonomic analysis using the ergonomic evaluation tools, anthropometrics, ergonomic product usage and other critical learning issues appropriate to each industry. Actual analysis was practiced in an ergonomics laboratory session as part of the training. Other highlights of the process included:

1. Ergonomics training annually for all high-risk employees of the organization, emphasizing self-correction of work areas and safer work practices.
2. Employees reporting ergonomic concerns to supervisors and triggering workstation analysis and recommendations by an ETF Surveyor.
3. Optional Voluntary CTD screen for employees with early symptoms performed by a healthcare provider.
4. Monthly, bi-monthly or quarterly ETF meetings to follow ergonomic activities and employees with concerns or injuries.
5. Implementation of recommended hazard prevention and control methods.

Ergonomic activities vary from team to team. In a feedback survey, the following table demonstrates the methods employed by each.

Task Force Activities	Participating Teams
-----------------------	---------------------

Select ergo products	5
Provide group training	6
Provide individual training	5
Evaluate worksites	6
Monthly team meetings	2
Bimonthly team meetings	3
Quarterly team meetings	1
Select training materials	2
Create/modify training	3
Create/modify forms	4
Expand/reduce team size	4
Other: Develop ergo library	1

Table 2. Common Ergonomics Task Force Activities

RESULTS

Monterey County Sheriff

Since beginning the ergonomics process in March 1994, the public safety agency has most effectively measured its CTD workers' compensation costs and claims as well as the program's impact in other claim areas. Through 1998, a savings of \$360,000 in workers' compensation medical and indemnity dollars have been saved by direct and indirect methods to manage CTDs, strains and sprains. Substantial cost reductions are noted in CTDs for the Sheriff's Department since the onset of the ergonomics process. Within the first year, a 75% reduction was noted and within 4 years, 83% reduction. CTD occurrences are down by as much as 32% overall.

As with most cost saving strategies that involve employee training, an increase in cost and frequency of the CTDs often is anticipated. However, this did not occur in the sheriff's case, or in any of the other teams within the first year start-up.

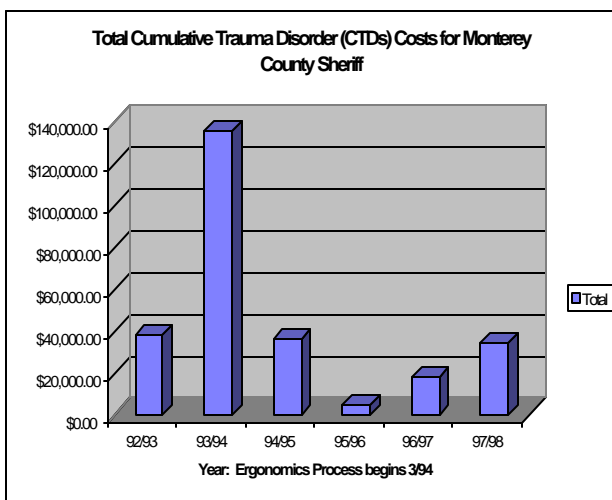


Figure 1. All CTD Claim costs from onset of program in March 1994 -98 for Monterey County Sheriff.

Occurrence has varied year to year as cases do continue to occur, but remain a relatively small percentage of the total injuries. At the Sheriff's department, chronic injuries that began prior to the start-up and early on in the process continue to bother longstanding employees often despite sound ergonomic strategies. These claims continue to incur annual costs. CTD claim activity in 1996/97, 1997/98 (Fig. 1) and 1998/99 (not shown) are largely the result of acute aggravations of chronic CTD cases originating prior to the program onset. New onset of CTDs is well managed and relatively inexpensive. Eight cases were reported in the 97/98 fiscal years with only 4 having any cost impact. In 1999, another 8 claims were reported with one claim exceeding \$20,000, and all others less than \$6,000.00 with 5 of those under \$1000.00. The last 2 claim years have resulted in relatively the same expense of approximately \$35,000.00. It is important to note that no new hires (approximately 50 to 60 employees) have filed any CTD claims to date since beginning the program.

Financial return in the Sheriff's ergonomics process has been carefully monitored as well. Key areas tracked include consultation on process development, CTD training, ergonomic furniture and equipment as well as the average per person investment. Overall, \$114,400.00 has been used to run the process investing \$250.00-\$275.00 per employee from 1994-98, or an average of \$68.00 per person annually. Return on investment (ROI) for every dollar invested has been substantial. To determine annual ROI, the following formula was used:

Net annual change in all injury/illness costs

Annual investment in the process

The program ROI has paid annually \$2.14 for year 2, \$13.00 for year 3, and \$5.50 for year 4 for every dollar invested using the formula above. Since beginning the process in March 1994, the Sheriff has invested 54% less the 2nd year and 74% less for the third year and another 55% less the 4th year relative to the start-up year 1994/95.

Other significant changes have occurred since the 98/99 fiscal years began. There was a change in leadership within the department, which has facilitated significant management change throughout the organization. Furthermore, the Ergonomics Process budget was reduced to its lowest at \$5000.00. The Ergonomics Task Force reduced their meetings from monthly to quarterly as well. Concern regarding the viability of the program is being monitored at this time as it moves into its 6th year.

Other Industry Results

The remaining task force participants in the study did not establish or benchmark their CTD/RMI claim and cost levels as accurately as the Sheriff. The process should run at minimum a full year before any comparisons can be made and at least 2-3 before any trends can be identified. Only two of the remaining five is likely able to do any cost comparison As a

result, return on investment is not measurable at this time. However, other performance measures indicate each team is achieving additional and substantial benefits from their ongoing efforts. Chairpersons report significant employee interest, willingness to change and value as a result of the ergonomics process. Table 3 demonstrates the employees impacted by each of the team's activities to date as it pertains to training and analysis.

Task Force	# Months or Years Active	# Employees Trained	# Ergonomic Analyses
College	2 yr. 2 mo.	100	35
Hospital	3 mo.	48	5
Bank	9 mo.	40	40
Bio-technology	5 mo.	70	6
Sheriff	5 yr 10 mo.	350	50
College	1 yr. 2 mo.	120	25

Table 3. Employees impacted by the task forces' primary activities of ergonomics training and analysis since start-up.

CONCLUSION

The results of the ergonomics process including the development of the Ergonomics Task Force demonstrates itself as a vital strategy to control workers' compensation losses. The process acts as a cost-savings strategy for the prevention and management of CTDs. Benefits improve with time, administrative and financial commitment to the process and are best justified through benchmarking and good record keeping. Improvement is noted in the following areas: increase in awareness of CTDs throughout the organization, integration of in-house expertise as an accepted management practice, safer work habits by a majority of employees, early reporting of signs and symptoms, better disability management by front line supervisors and management, improved multi-level communication and improved employee morale for the affected groups. The Ergonomics process including an ergonomics task force demonstrates itself as a flexible tool capable of achieving significant measurable outcomes.

Critical components include commitment from administration and middle management for team process and employee involvement, establishing budgets to support ergonomics change and benchmarking initial costs, claims, concerns and activities to measure future outcomes. In the more mature processes, retraining of the task force members or new members is useful. In addition, pre-existing CTD claims that were filed or employees' with longstanding symptoms that have not yet reported will likely continue to be aggravated, despite the best efforts of the team and organization. It is the pursuit of prevention and identifying the symptoms early that is most impacted by the ergonomics process. Furthermore, it is demonstrated that the participatory ergonomics approach has lead to a cultural change in the organization's advancement

towards the prevention and management of all work injuries. This type of change integrates well into the organizations' mission, increasing employee value and job satisfaction for all those involved adding to the "best practices" approach.

ACKNOWLEDGMENTS

The author would like to recognize the dedication and interest of the organizations discussed in this outcome study. Their hard work and dedication to the ergonomics process allows us all to benefit from the significance of sound ergonomic strategies contributing to an organization as a whole.

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Preventive ergonomic strategies demonstrate substantial cost benefit for small to mid-size employers

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Abstract

Historically, employers base business decisions on the financial profile of their company. When the company is on hard times, investments in improving the quality of the business are often put on hold. Ergonomics is a business strategy that falls into the optional investment category, even if it is something that needs to be done as an intervention to reduce work-related musculoskeletal disorders (WMSDs) and stem rising workers' compensation costs and other related losses. In the USA, employers pay a premium for workers' compensation insurance but only if they are self-insured, do they truly pay the direct cost for injuries. As a result, work-injuries are perceived as a cost of doing business as there is often no line item budget to demonstrate the true cost required to pay for medical and lost time expenses. Employers that look beyond the financial profile of their company to understand the value of investing in the human asset will recognize and invest in preventing work injuries using ergonomic strategies. This session will demonstrate how small to mid-size companies choose to invest in preventing work injuries through ergonomic strategies. The financial implications of a variety of ergonomic interventions will be discussed to show the cost benefit of each method. Methods include using an ergonomics task force for in-house expertise, using an outside consultant to conduct ergonomic analysis for early symptom management, training employees and purchasing ergonomic products and accessories to invest in facility assets. A financial model will be presented to show the cost benefit these companies have experienced.

Keywords: investment, human asset, cost-benefit, prevention, ergonomics task force

1. Introduction

Employers in the United States are under no specific Federal or State mandate to utilize ergonomics in the workplace as a preventive or management strategy to reduce the risk of injury and illness at the workplace. There is one exception; the State of California has a state OSHA (Occupational Safety and Health Administration) Regulation known as Title 8 of the General Industry Safety Orders, Article 106, Ergonomics, Section 5110, Repetitive Motion Injuries. [1] The regulation went into effect on July 3, 1997 and requires that all employers implement

an ergonomics program if they meet the scope of the regulation. This regulation, while reactive, requires employers to respond when more than one repetitive motion injury (RMI) occurs in the workplace that is predominantly due to an identical work task that has been diagnosed by a physician within a twelve month period of time. The California regulation requires employers that meet the scope to implement the following program:

1. Worksite Evaluation.
2. Hazard Prevention and Control Measures.
3. Training (for high-risk individuals).

With or without regulations, employers are realizing the multiple benefits of using ergonomics in

the workplace. This is evident by the decline in cumulative trauma disorders and repetitive motion injuries since the mid-1990.

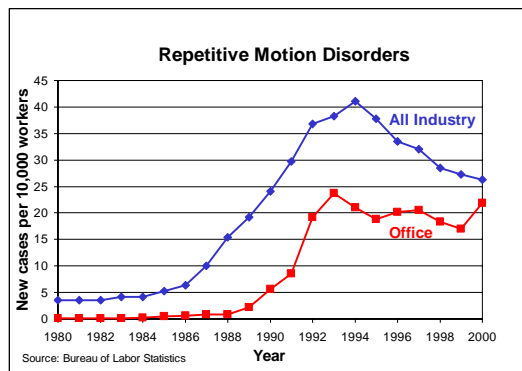


Fig. 1: Bureau of Labor Statistics, 2001

While the Bureau of Labor Statistics is no longer specifically monitoring RMIs since 2003, all are now clustered together under musculoskeletal disorders, these injuries continue to decline. With this in mind, more employers are using ergonomics as a strategy to improve productivity, increase efficiency at work and increase comfort at the workplace and they are doing it because they have chosen to make the investment, not because they have to do it to comply. This in turn, results in a downward trend in recordables as seen in Figure 1.

Employers choose to invest in ergonomics when they value the human asset, their employees. Despite desire to want to invest in ergonomics, the investment must be justified. Managers need methods and tools to demonstrate the financial viability of funding ergonomics proposals. Using cost benefit analysis to convince otherwise skeptical administrators that the value of people must not be underestimated and that the workers are their key to profit is the best way. [2]

1.1. Types of economic analysis

Over the past decade many models were developed to evaluate cost effectiveness of ergonomic interventions and health and safety measures. Many of these models are complex with data that must meet specifications defined by the model. As a result, in many cases data needs to be collected or processed by different departments in a company resulting in a sometimes limited application. [3] The literature 2006 IEA Paper

shows that cost benefit analysis when used by management can substantiate the benefits of ergonomic improvements over time. Some noted Ergonomists to utilize various types of formulas include Dr. Paula Liukkonen of Stockholm University., Dr. Arne Aaras, Professor Guy Ahonen, Dr. Per Dahlen, Dr. Hal Hendrick and this author. While each has published their models, each is tied to a specific set of conditions that demonstrate positive financial results from ergonomic interventions that cannot necessarily be generalized. [2]

In Oxenburgh's latest book, he notes three fundamental types of economic analyses that can be used to justify an ergonomic proposal. They are financial appraisal, cost effectiveness analysis, and cost benefit analysis. He also states that a worthwhile investment is when the benefits outweigh the costs and each of type of economic analysis can assist in the justification. [2]

Financial appraisal is the simplest model that considers costs and benefits that affect the organization itself. It is considered a micro-economic model using the cost of the proposal and then calculates the benefits from the proposal over time to account for return on investment (ROI). The cost-effectiveness analysis compares the cost and benefits of a proposal to the organization including the social and cultural impact and is considered a macro-economic model. The third is cost-benefit analysis which can be applied to any economic analysis and places a dollar value on all factors. [2]

Koningsveld notes that cost effectiveness evaluations can be done for several reasons:

1. To convince people that investments in health and safety are useful.
2. To evaluate a proposed investment or to evaluate the decision afterwards.
3. To benchmark to other companies.
4. To follow a trend in time.
5. To sell products or systems.

He also reports that management often makes decisions based on several considerations that often do not include financial information (expected ROI). Interviews with employers reveal that a decision to invest or not is sometimes made emotionally rather than rationally, often using a "gut feeling". This might be added as the 4th type of analysis, the "abdominal analysis". Kongsingveld notes, like Oxenburgh, that after studying much work by other experts and his own, Kongsingveld finds that it is impossible to draft a general model that can easily be

filled out by anyone and that answers all questions about all kinds of interventions or policies in the field of occupational health and safety. [3]

2. Methods

A benchmarking study by this author was published in 2001 and utilized a financial appraisal formula to determine cost benefit of a proposal. [4] The study focused on ROI as a critical monitoring factor to determine success of utilizing an ergonomics task force as part of a participatory ergonomics process.

This formula is based on a company's tracking of the medical costs associated with their own musculoskeletal injuries, in particular, repetitive motion or cumulative trauma type injuries over time or annually. This dollar cost is compared to the money invested in the proposal annually and includes costs associated with consulting, training, product purchases and other ergonomics process expenses. To determine the annual ROI, the following model is used:

$$\frac{\text{Net annual change in all CTD injury/illness costs}}{\text{Annual investment in the process}}$$

The formula can be generalized to account for all workers' compensation medical costs due to MSDs or CTDs divided by the annual investment in the process. [4]

Modifications to the model may be necessary if a company does not effectively track their workers' compensation costs or is unwilling to provide the data to the requesting party. Modifications to the formula would require a more general approach seeking cost average from state or other insurance databases. For example, a modified version of the formula is provided below:

$$\frac{\text{Average State or Company Workers' Compensation Costs per claim x \# Claims Prevented}}{\text{Annual investment in the process}}$$

In this report, the model is applied to three distinctly different scenarios. Each presents with various challenges and limitations based on the available client data. Case 1 allowed for the financial analysis with true cost data comparison year to year. Case 2 and 3 utilized the modified formula to determine ROI.

3. Results and Discussion

3.1: Case 1: Using an Ergonomics Task Force as part of an ergonomics process to prevent and manage injuries

A long term study spanning from 1993-2001 tracked six different organizations as they implemented an ergonomics task force (ETF). The ETF is generally composed of the following designations; Program director, Chairperson, Surveyors [2], Purchasing Coordinator, Training Coordinator, Secretary and Maintenance. The task force becomes the in-house experts for preventing and managing work injuries for the organization. The responsibilities and activities varied from team to team and include many different types of tasks. They are the selection of ergonomics products, providing group and individual training, performing office worksite evaluations, conducting regular team meetings, selection of training materials, and developing an ergonomics product library. Companies were encouraged to identify their workers' compensation injury costs during the course of the study to benchmark and compare their outcomes annually, but unfortunately only one organization, the Monterey County Sheriff's Office, was able to track that data over time allowing an effective use of the model presented above. The results demonstrated a significant ROI annually for the first four years studied. In particular, the financial return for every dollar invested in the ergonomics process for the Monterey County Sheriff's office demonstrated a \$2.14 payoff for the second year of the program compared to the first year, \$13.00 for year three and \$5.50 for year four of the program. Furthermore, substantial reduction in repetitive motion and cumulative trauma injuries were also noted over the same time period for the Sheriff's agency. [4]

The other participating agencies did not have regular access to their workers' compensation medical records over time and primarily failed to benchmark at the start of the process. As a result, they were not able to demonstrate any ROI simply because there was no means of comparison. In regards to measuring outcomes, managers simply shared feedback about the results they obtained or went by a "seat of the pants" judgment or "abdominal analysis"

as discussed earlier, regarding the program benefits. [4]

3.2: Case 2: Using ergonomic analysis to prevent and manage injuries.

In this second scenario, a small publishing company with 75 employees took an aggressive preventive approach to managing early signs and symptoms reported by employees. The employer would contact the consulting ergonomist to conduct ergonomic worksite analysis within a few days of notice. The protocol involved interviewing the employee on essential work practices and noted concerns regarding work tasks, workstation set-up and associating symptoms that the employee may experience during the course of the work day. Anthropometric measurements along with employee education on how to adjust and utilize any ergonomic accessories including chairs, keyboard trays or other items were provided during the analysis. Quick fixes were performed whenever possible to change or modify the existing set up so that better ergonomics could be achieved. Employees also received information on self-care, early symptom management and onsite stretching that they could do at the workplace. A report of findings and recommendations was presented to management shortly after that suggested various facility changes, administrative actions and product purchases to remedy the identified problems.

During 2004, eight employees were seen with early symptoms resulting in no claims filed. Based on the investment made by the employer in consulting, analysis and product purchases and their average workers' compensation costs per claim, a return on investment was determined. In this case the modified formula was used to determine ROI. Their average claim costs per case from insurance records were approximately \$7,691.00. This cost was multiplied by the eight claims prevented to identify the numerator. An average cost per ergonomic analysis of \$421.00 combined with an approximate equipment investment of \$300.00 per employee determined the denominator.

Return on investment = $\frac{\$61,528.00}{\$5770.40}$

Based on the average costs per claim and the investments made in the program, the employer demonstrated an ROI of \$10.66 for every dollar

invested by using the preventive services described above. This figure does not represent the productivity gains made by avoiding lost time and modified duty that would have resulted with additional claim filing. With this in mind, the gains are even more substantial.

3.3: Case 3: Using ergonomic analysis and training to prevent and manage injuries.

The third case occurs in a biotechnology company in 2004 also that has two separate locations with approximately 150 employees. The priority for this employer was also to prevent work injuries and selected consulting, office and laboratory ergonomics training and ergonomic worksite analysis for office and laboratory to address their concerns. For this case, the client was not willing to provide their workers' compensation cost data for use in doing a more accurate financial appraisal of the services provided. As a result, in order to determine the ROI for this client, the average cost per workers' compensation claims (indemnity) for RMIs in California was used (\$34,627.00).[5] This cost was multiplied by the number of ergonomic evaluations conducted (20) anticipating that without the interventions that these would likely have gone to the insurance company as workers' compensation claims. The employer also held a number of training programs focusing on office and laboratory ergonomics which impacted approximately 75 employees in the workplace. For this employer, the total invested in their 2004 ergonomics process which included consulting, training, ergonomic analysis and products purchased was \$20,214.34. Using the modified formula:

Return on investment = $\frac{\$692,540.00}{\$20,214.34}$

Based on the average costs per claim and the investments made in the program, the employer demonstrated an ROI of \$34.26 for every dollar invested by using ergonomic analysis, employee training and consultation in work injury prevention and management. By avoiding lost time and keeping employees at work, additional gains in productivity are also likely.

4. Limitations of Study

A critical aspect in determining realized benefits of return on investment using the formulas

presented in this paper is based on the claims cost information that the employer provides to the consulting ergonomist. Without this data, the financial appraisal can not happen or is likely to be less accurate than if real data is used. In both Case 1 and 2 real data is provided for the consultant to compare over time the investments of the ergonomics process relative to claims prevented and associating costs.

In Case 3 however, the average cost per claim was taken from state insurance reports and is high as it is based on those cases in California that result in lost work time and temporary disability. A more accurate representation would be based on those cases that resulted in medical only care. These costs are more like those found in Case 2.

As noted earlier by both Oxenburgh and Koningsveld, and as this study shows, it is difficult to draft a general model that can easily be filled out by anyone and that answers all questions about the interventions provided. Consistency in data seems virtually impossible to achieve.

5. Conclusion

It is important to note that an active role by management and employees along with the ergonomist is crucial in implementing a well structured program so that a return on investment can be achieved and injuries prevented. The more involved management and employees are in a participatory approach, the more robust the financial benefits will be. [6] Furthermore, the role of the workforce as well as management is essential when collecting relevant information for a cost benefit study. [2] This study demonstrates how important utilizing existing workers' compensation claims cost data is in realizing significant financial benefits for injuries prevented relative to the investment made in the ergonomics process. The more real the actual cost figures provided, the more accurate the financial analysis is for the employer further demonstrating that the investment is well worth the outcomes achieved.

6. Acknowledgements

The author extends deep gratitude to the Monterey County Sheriff's Department for the opportunity to follow the results of their ergonomics process over time. The author also would like to

express appreciation to the other clients who participated in Case 2 and 3.

7. References

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