

21st Century Ergonomics: A Lean Approach to Ergonomics Process Design and Management

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Ergonomics strategies are becoming more common in the workplace for a variety of different reasons. These include productivity and efficiency gains, reducing the risk of work injuries, improving workstation design and layout, enhancing tool design or all of the above. One such strategy that generates significant results by addressing multiple reasons is the development and integration of an Ergonomics Process (EP) into the organization. The EP is a lean, pro-active and participative approach that is designed to prevent and manage work injuries quickly and effectively. The EP is based on the theory of Macro ergonomics, continuous improvement, participatory ergonomics and modern day lean system thinking. The EP described in this paper demonstrates a practical and efficient approach to the design of work systems that engages employees, management and administrators to impact the organization at the macro and micro ergonomics level, resulting in a powerful return on investment through increased productivity, employee work health satisfaction, and significant cost savings.

Key words: Macro ergonomics, lean process, participatory, quality

INTRODUCTION

Developing and managing an Ergonomics Process is one of the most effective ways to proactively prevent, mitigate and manage injuries and illnesses in the workplace. It will reduce claim frequency, severity and the associated direct and indirect costs. Not only is Ergonomics mandated by the State of California through the Cal-OSHA regulation 5110, and is part of an employer's responsibilities in effective worker' compensation and disability management (ADA), but it is also well documented in the ACOEM (American College of Occupational and Environmental Medicine) guidelines designed to improve the medical management of claims and the associated medical costs. Ergonomic reports and documentation remains mindful of HIPAA (Health Insurance Portability and Accountability Act) privacy policies by primarily focusing on function and its impact at work, rather than medical diagnosis and treatment. These guidelines, laws and regulations address the legal compliance, fiscal and employment responsibilities that private and public agencies have to prevent and manage injuries more effectively.

There is also the perceived social and moral obligation to preserve employee health and safety for a longer and more productive work life. The Ergonomics Process addresses the above objectives ensuring a positive, pro-active, participative "partnership" between the "employee and employer". The EP stewards taxpayer or private industry dollars and preserves the employee's productivity, health and safety during the course of their employment.

The Ergonomics Process (EP) model is a lean, pro-active, integrated and participative organizational process that is designed to prevent and manage work injuries as

quickly and effectively as possible. The EP is based on the theory of Macro ergonomics and focuses on the design of the overall work system and strives for continuous improvement. The Ergonomics Process model presented takes a "top down" approach to the design of work systems that carry through to the human-machine-software interface within the organization (Hendricks and Kleiner, 2001). It also takes a "bottom up" approach by engaging employees in the process from the beginning. Process design also involves middle management to ensure accountability. It is intended to support occupational and non-occupational injuries, illnesses and disabilities that impact employee productivity. The Ergonomics Process is designed to meet compliance with Cal-OSHA, California Labor Code, Federal ADA legislation, HIPAA and includes but is not limited to:

- Analysis of individual workstations, departments, tasks, process, equipment and tools used;
- Training of individuals and departments on office and industrial ergonomics;
- Consulting on issues related to facility planning, injury prevention and disability management, installation of new processes and the purchase of new equipment or furniture, office ergonomic accessories and tools;
- Implementation of hazard prevention and control measures to mitigate and/or eliminate exposures to primary and secondary risk factors known to cause or increase the likelihood of work-related injuries.

PRACTICE INNOVATION

Ergonomics Process Model:

The EP model presented in this paper is based on various business and ergonomics models that promote efficiency and effectiveness within an organization to “operationalize” ergonomics as part of the routine day to day management of employee health and well being. Primarily, the theory of Macro ergonomics defined by Hendricks and Kleiner (2001) is essential and focuses on the “ design of the overall work system” which takes a top-down sociotechnical systems approach to the design of work systems that carry through to the human-machine-software interfaces. This ensures the entire work system is fully harmonized. Other theories include Imada and Noro’s “participatory ergonomics” approach which involves employees (end users) as stakeholders in the analysis and design of their work environments and work activities. Quality management and continuous improvement of the EP is recognized based on theories proposed by Dr. E. Deming, where all steps within the process work together toward quality that the ultimate “customer” will boast about. Whereas lean manufacturing principles (Liker, 2004) strive to eliminate waste, errors and unnecessary actions and include only those value-added components to enhance the process flow.

Ergonomics process characteristics are also based on business process models of work flow (Harrington, 2001) that will ultimately result in improvement. These include:

- 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

A sample Ergonomics process flow is provided in Figure 1 to demonstrate the key principles discussed.

Measurements

Measurements are crucial to defining the results and validating the success of the ergonomics process. Harrington states, “If you can’t measure it, you can’t control it. If you can’t control it, you can’t manage it. If you can’t manage it, you cannot improve it. “With this in mind, the following business process measures are used in the application of the EP. Effectiveness is measured as the percentage of evaluations scheduled in a timely manner; the percentage of reports completed in the time allocated. Efficiency is measured by determining if control measures

recommended are appropriate; costs for recommendations are reasonable and necessary; assure they are not wasteful and that the time from the site visit to implementation is in a timely manner. Adaptability of the process is also monitored to assure that special needs are addressed as one size doesn’t fit all.

Through the process, a quality measure of distinct time allocations is provided to keep the process flow within a 30-90 day time frame of implementation as often as possible.

The EP is a lean, pro-active approach driven by employee and management participation. It is based on employee self-assessment to address concerns in a positive and preventive manner. The EP is a continuous improvement process designed to address ergonomic issues in the office, healthcare, lab, industrial areas and other non-traditional jobs.

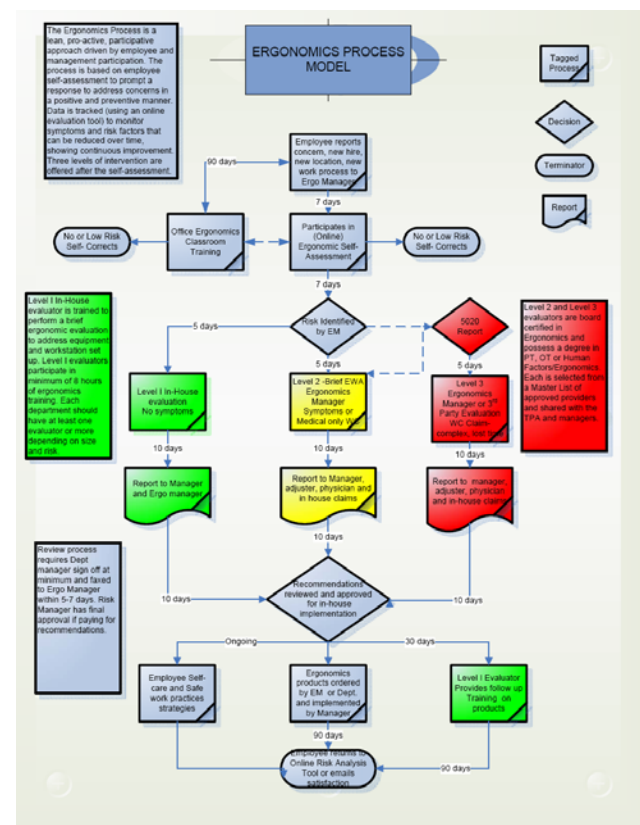


Figure 1. Ergonomics Process Model Flow Chart

The model uses the following components as part of a comprehensive ergonomics process:

- Online (office or industrial, if available) self-assessments completed by employees
- Office/Industrial ergonomics training (live)
- Ergonomics analysis of work environment by in-house evaluators or Level 1 evaluators, or Level 2-Level 3 evaluators

who are qualified Health Care providers certified in Ergonomics.

- Accountability by management in sharing report with employee, obtaining signatures and returning to Ergonomics Manager
- Implementation of engineering (purchases) and/or administrative control measures
- Follow up by employee to assure closure through completion of online tool or email.
- Managed by an Ergonomics Professional (or ergonomics committee)

Qualified Evaluators

Level I In-House evaluators are trained to perform a brief ergonomic evaluation to address equipment and workstation set up. Level I evaluators participate in a minimum of 8 hours of ergonomics training and are trained by a Board Certified Professional or Industrial Ergonomist. Each department should have at least one evaluator or more depending on size and risk.

Level 2 and Level 3 evaluators are board certified in Ergonomics and possess a degree in PT, OT or Human Factors/Ergonomics. Each is selected from a Master List of approved providers and shared with the managers and insurance providers.

FINDINGS

Preliminary Results

The Ergonomics Process model was implemented at the County of Monterey (4500 employees) and has only been active since December 2007. However, using a return on investment formula (Heller-Ono, 2001 and 2006), the County of Monterey is able to demonstrate an early return on investment. The County of Monterey Risk Management Department has set a conservative first year fiscal budget at \$160,000.00. To date, approximately \$70,000.00 has been used to launch the process, provide outside evaluation services, ergonomics training and purchase products for employees as mitigation measures

Early results demonstrate that the process has already had significant impact in just the first 12 months (1/08-12/08). These early indications include analysis of 141 employees with early reported symptoms and numerous existing workers' compensation claims. The breakdown is as follows:

Proactive/Preventive Evaluations:	67	47.5%
WC Ergonomic Evaluations	74	52.5%
Total Ergonomic Evaluations:	141	100%

The Ergonomics Manager evaluated 85 or 60% of the employees and the contracted ergonomic service providers evaluated 56 or 40% of the employees. This allowed substantial cost savings in reducing the use of the

outside services to primarily the workers compensation claims and the ergonomics training. Use of the contractors freed up the Ergonomics Manager for ongoing oversight and the continued development of the Ergonomics Process.

Data is tracked for each case to monitor the time it takes from the site visit when the analysis is performed to product and recommendation implementation for preventive evals and workers' compensation cases. Average time for implementation for proactive evals is 48 days while workers' compensation cases were at 70 days. Increased time is attributed to requiring physician authorization on the medical claims to concur with the recommendations. However, this is within the quality standard set for 30-90 days to implementation.

The average incurred costs of using ergonomic analysis and purchasing products to mitigate the cases are as follows:

Average cost per preventive evaluation: \$345.00

Average cost per WC ergo evaluation: \$500.00

Average cost of ergo equipment and purchases for preventive evaluation: \$442.50

Average cost of ergo equipment and purchases for WC evaluation:
\$492.50

When comparing historical cost data, the first year program generated immediate savings for those 67 evaluations that had not yet matured into actual claims. It is projected that at least 1/3 of these would have become indemnity claims and 2/3 would have remained medical only claims. With this in mind, the following savings are projected:

Medical Only:

Average cost of medical only claim: \$ 3500.00

X 2/3 of preventive evals (44 cases) = \$155,000.00

Minus the Cost of the interventions:

(Analysis and purchases for all cases) \$48,968.00

Total Anticipated Savings Year 1: \$105,802.00

Indemnity:

Average cost of indemnity claim: \$ 45,000.00

X 1/3 of preventive evals (22 cases) = \$990,000.00

Minus the Cost of the interventions:

(Analysis and purchases for all cases) \$ 21,824.00

Total Anticipated Savings Year 1: \$968, 176.00

Grand total savings as the result of preventing 67 claims and managing 74 workers' compensation claims aggressively and effectively with Ergonomics...approximately **\$1.1 million**.

To determine a return on investment, the formula (as defined by Heller, 2006) was used:

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

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

The current projected Return on Investment (ROI) for the County's Ergonomics Process is \$15.53 saved for every \$1.00 invested. This is based on the projected costs per claim x the number of proactive evaluations performed divided by the annual investment made to date. These returns are consistent with other ROI studies conducted by Heller-Ono (2001, 2006).

DISCUSSION

The Ergonomics Process model presented is a highly transferable process that can be adapted for use by organizations in both the private and public sector. If the agency or organization does not have a designated Ergonomics Manager, then it would certainly be appropriate for a Risk Manager or Safety Officer to oversee the process. It would also be appropriate to have an Ergonomics Sub-Committee or Task Force develop and manage the process. This would require express roles and responsibilities to be defined to facilitate a team approach. Whether it is a single individual or a team approach accountable to the process, successful outcomes can only be achieved when management is fully committed from a financial and organizational leadership perspective. Management must be involved and committed to the success of the process as part of a top down approach.

Perhaps most crucial though is the involvement of employees from the beginning of the process through training and self-assessment. Employees are required to attend training to learn skills and methods to self-identify and self-correct ergonomic issues in their work area as able. If they are unable to correct on their own or are experiencing issues with their workstation, have symptoms associated with work or a safety concern, then a request is made by the employee and signed by the supervisor entering them into the ergonomics process. A self-assessment is provided by email or online for their completion, which then launches the ergonomics process

flow. Employees are engaged throughout the entire process along with their supervisors (and managers) as a result.

This approach to Ergonomics Process design and implementation notes that the more involved management and employees are in a participatory approach, the more robust the financial benefits will be. In addition, 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.

Establishing an Ergonomics process based on the theories and principles described is a commitment to drive change in the organization via a powerful business process, ergonomics. Those that choose to implement an EP will experience significant improvement in employee health and safety demonstrating continuous returns for years to come.

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