

Naval Facilities Engineering Command Ergonomics Risk Assessment for Biomedical Equipment Repair

Introduction

This report summarizes the ergonomics risk assessment conducted at on November 14th, 2006. The Biomedical Repair Shop was observed in order to determine sources of ergonomics stress and recommend improvements. This assessment is based upon interviews with employees and supervisors as well as an evaluation by a Certified Professional Ergonomist from the Naval Facilities Engineering Command (NAVFACENGCOM) Hazard Abatement and Mishap Prevention (HAMP) program.

The risk assessment was conducted in conjunction with the Job Requirements and Physical Demands Survey (JR/PD). The JR/PD is an ergonomics survey designed to assess ergonomics risk in the workplace. The results of the JR/PD indicate the Biomedical Repair Shop is an ergonomics problem area with a score of **seven** on a scale of 1 to 9 where 9 is a maximum value. The JR/PD assesses five distinct body regions: shoulder/neck, hand/wrist/arm, back/torso, legs/feet, and head/eyes. All the body regions except for the head/eye region were found to have significant ergonomics risk. Ergonomics risk is based upon ergonomics stressors associated with the task and employee discomfort. A significant number of employees reported experiencing work-related pain or discomfort that does not improve when away from work and interferes with their ability to carry out non-work related activities. Fifty-five percent of the survey respondents have seen a health care provider within the last twelve months for pain or discomfort that he or she feels is related to the job. A significant number of employees also reported pre-existing Musculoskeletal Disorders (MSDs) as well as illnesses recognized as contributing factors, which places them at a higher risk of additional or more severe Work-Related Musculoskeletal Disorders (WMSDs). Appendix I contains a summary of the JR/PD results as well as a description of the methodology.

The operations reviewed present the opportunity to reduce the risk of WMSDs. Recommendations to the command to reduce the probability of injury include equipment purchaseⁱ, process redesign, and implementation of administrative controlsⁱⁱ.

Musculoskeletal Disorders (MSDs) are injuries and illnesses that affect muscles, nerves, tendons, ligaments, joints, spinal discs, skin, subcutaneous tissues, blood vessels, and bones. Work-Related Musculoskeletal Disorders (WMSDs) are:

Musculoskeletal disorders to which the work environment and the performance of work contribute significantly or
Musculoskeletal disorders that are aggravated or prolonged by work conditions.

Representative vendor information is included in the recommendations to assist in the evaluation of products and servicesⁱⁱⁱ. Recommendations to the command include gathering input from the workers, safety specialists, and other personnel to evaluate equipment before purchasing. This process will increase product acceptance, test product usability, and durability, and takes advantage of employee experience.

The command may request additional funds from the Chief of Naval Operations (CNO) Hazard Abatement and Mishap Prevention (HAPM) Program to abate the risk of injury. Naval Facilities Engineering Command (NAVFACENGCOM) administers the CNO Hazard Abatement Program, which is a centrally managed fund to correct safety and health deficiencies beyond the funding capabilities of the activity. Information about the HA program can be found on the Naval Facilities Engineering Command web site www.navfac.navy.mil/safety and in OPNAVINST 5100.23G chapter 12 Hazard Abatement. The application deadline for FY08 funding is February 28th, 2007.

BIOMEDICAL EQUIPMENT REPAIR

Purpose of the Operation

Employees perform preventative maintenance and repair on a variety of medical equipment and their components.

Population

Eighteen active duty repair technicians

Injury Data

Fifty-five percent of the JR/PD survey respondents have seen a health care provider within the last twelve months for pain or discomfort that he or she feels is related to the job.

Description of the Operation

Personnel repair, calibrate and install medical and dental equipment. The biomedical repair shop services National Naval Medical Center as well as 13 outlying clinics and various other facilities including the White House, Air Force One, Camp David, the Capital Building, etc. The equipment is either transferred from the ward / department to the medical supply repair shop or the repair is performed on-site. Equipment that is sent to the hospital for repair arrives at a loading station and is then moved ¼ mile through the hospital to the repair shop. Examples of equipment include hospital beds, blood pressure units, life-saving equipment, and x-ray machines.

While working in the repair shop located at the hospital, many of the repair tasks are performed at a workbench as shown in figure 1. Repair orders are sent to the shop and then assigned to a technician. The technician receives the orders via a computer, figure 2. The technician also uses the computer to continually update the project status of the repair job, record test results, and order new parts. Workers spend about two to four hours per day on the computer. Workers also make frequent and sometimes extended duration phone calls to do technical research and trouble-shoot repairs, figure 3.

When the equipment is too big for the workbench, repairs are regularly performed on the floor. Technicians frequently kneel, squat or lie on the floor while twisting their torso and/or reaching overhead, figures 4-6. The technicians use carts (figure 7) to transport equipment through the shop and the hospital, but there aren't enough carts to accommodate the entire staff.



Figure 1: Employee at workbench



Figure 2: Employee on computer



Figure 3: Employee on telephone



Figure 4: Working overhead



Figure 5: Twisting



Figure 6: Kneeling



Figure 7: Shop cart

Workers frequently perform repair calls outside the hospital. Workers transport their tools in wheeled cases when performing repairs on-site. Many of the off-site areas do not have elevators and heavy equipment is carried up stairs by hand.

Ergonomic Issue Description and Recommendations

Shop repair tasks can require sustained awkward postures of the back, neck, shoulders and legs as well as contact stress, heavy lifting, and prolonged standing.

Awkward Postures: Technicians routinely sustain awkward postures of the back and neck while leaning over parts at the workbench, twisting to view the monitor, and cradling the phone with their shoulder. The muscles must apply considerably more contraction force to maintain awkward postures. As the duration of the contraction increases, stress on the muscles also rise. The continuous stress on these muscles can lead to fatigue and discomfort which can be precursors to injury. Static awkward postures impede the flow of blood needed by the muscles to supply nutrients and remove the waste products of muscle metabolism. Reduced blood flow also slows delivery of oxygen to the muscles resulting in a longer recovery time. Waste products, such as lactic acid, can build up in the muscle and cause fatigue. Awkward postures increase the muscular effort required to do the task. The longer or more frequently static loading occurs, the greater the risk of injury due to overuse of muscles, joints, and other tissues.

Technicians also assume awkward postures of the back, hips, knees and ankles while squatting or flexing forward during repair operations; for example, when working beneath or on the side of equipment, figures 4 and 5. Hyper-flexing the knees in a squatting or kneeling position can result in pressure on the back of the knees which may reduce circulation in the lower extremities and can lead to fatigue and discomfort, figure 6.

Contact Stress: The employees are exposed to contact stress while leaning their elbows and forearms on the work surface edge while working at their bench and while kneeling on the floor. Hand tools can also cause contact stress in the palms. Contact stress results from a compression of the soft tissue by a hard object. A concentrated

force can reduce blood flow and nerve transmission as well as cause damage to tendons and tendon sheaths.



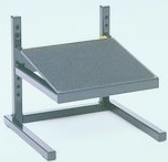
Heavy Lifting: Employees perform heavy lifting while transporting new equipment. For example, the technicians assist warehouse personnel by lifting and rotating 600lb. dental chairs on a pallet for transport. Employees also lift equipment during repair operations to access the underside of the equipment or raise it to a working or bench height. The workers risk injury from forceful exertions caused by lifting. Forceful exertions can place high loads on the muscles, tendons, ligaments, and joints being used. Increasing the force required to lift a load also means increasing body demands (i.e. greater muscle exertion is necessary to sustain the increased effort) and imposing greater compressive forces on the spine. As force increases, muscles fatigue more quickly. Prolonged or frequent exertions of this type can lead to WMSDs when there is not adequate time for rest or recovery.


Prolonged Standing: Workers stand for much of the day. Standing for long periods can be a strenuous activity that promotes blood pooling in the legs and feet and can result in discomfort and fatigue.

Illumination: A lighting study conducted in the repair shop by the Industrial Hygiene Department revealed light levels as low as 95 lux at certain workbenches. Poor lighting can lead to eye fatigue and eyestrain. Inadequate illumination can also contribute to awkward postures as workers lean over parts to gain visibility. Office cubicles were measured at 62 and 82 lux. According to the Illuminating Engineering Society lighting guidelines, work at visual display terminals for long periods of time should range from 300-500 lux. Visual tasks of medium contrast or medium assembly should range from 500 to 1000 lux. The Industrial Hygienist who conducted the lighting survey recommended a minimum illumination of 750 lux at the repair workstations with adjustable task lighting and magnifiers.



Recommendations

- ∞ New Electrical Static Discharge (ESD) workstations, chairs, and industrial footrests are recommended to reduce ergonomics stressors. Workstations should have a pedestal base, height adjustable ESD surface, electrical outlets and task lighting. Refer to table 1 for vendor information.

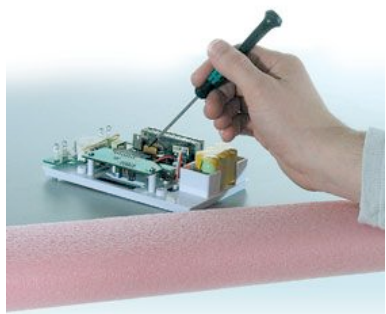
Table 1: Workstation recommendations			
Vendor	Description	Estimated Cost	Figure
Peak Logix 703-819-6061	6 Pro-line Heavy Duty Pedestal Workstations with ESD Laminate Top and electrical outlets and overhead lighting	\$17313	
Ergosource 952-404-1969 www.ergosource.com	Levitech workstation-pricing done to spec	Pricing depends on configuration	
Grainger 904-636-8896 www.grainger.com	Pro-Line Workstations-pricing done to spec		
Global Industrial 1-800-645-1232	Effortless Stool-completely adjustable XF252374 Casters optional	\$252	
C&H 1-800-558-9966	Workspace, Bevco, and Krueger Stools	\$226-\$243	
Lab Safety and Supply 1-800-356-0783	Biofit and Bevco	\$206-322	
Alimed 1-800-225-2610	Factory Footrest	\$116-\$191	
Lab Safety 1-800-356-0783	Industrial Footrest	\$109	

Grainger	Industrial Footrest	\$96	
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∞ A lighted magnifier would provide the technicians working at the bench with additional lighting and assistance in repairing small parts in order to reduce eyestrain and promote neutral postures. Refer to vendor table 2 for more information.

Table 2: Magnifier			
Vendor	Description	Estimated Cost	Figure
Delphi (800) 248-2048	Magnifying Lamp	\$70	
Grainger Lab Safety and Supply 1-800-356-0783	Magnifier Luxo magnifiers (KFM and Ledo lines)	\$100-\$250 \$170-\$370	




∞ A front edge support can reduce contact stress to the forearms while working at the bench. Table 3 has additional vendor information.

Table 3: Edge protector			
Vendor	Description	Estimated Cost	Figure
Alimed 1-800-225-2610	ESD edge protector	\$21-\$35	





- ∞ An equipment lift would allow the technicians to raise equipment such as hospital beds up so they don't have to work on them from the floor. Refer to table 4 for additional information.

Table 4: Lift			
Vendor	Description	Estimated Cost	Figure
Motorcyclejacks.com 203-385-3871	A lift capacity of 1500 lbs, Pneumatic or manual operation. Lift range from 7" to 41" Top platform area of 29-1/2" x 82" (two included extension side plates increase the area to 51" x 82")	\$1297	
http://www.lift-buddy.com/ 1-877-832-4136	800, 1000, or 1500 lb. capacity	\$539-\$664	
Grainger	Low Profile Table, Load Capacity 550 Pounds, Raised Height 30.0 Inches, Lowered Height 2.9 Inches, Voltage Rating 115 Volts, Length 40.0 Inches, Width 23.5 Inches	\$2509	
Peaklogix 703-819-6061	Electric portable scissor lift cart. 1,100 lb. capacity, 30"x40" platform. Height adjustable from 10.5" to 36.5". 12 Volt DC power with battery charger and held pushbutton control.	\$1918	

- ∞ Creepers and mechanics seats would support the employees while they perform repair tasks low to the ground. An angle-adjustable creeper will support the upper torso and bring the worker closer to the repair area to promote more neutral postures and reduce static muscle loading. Refer to vendor table 5.



Table 5: Creepers and mechanics seats			
Vendor	Description	Estimated Cost	Figure
Eidos Corp 1-800-210-9666	Angle adjustable creepers	Price depends on features	
Northern Tool & Equipment Co 800-221-0516		\$60	
Whiteside 470 363 1179		\$147	
Lab Safety 1-800-356-0783		\$114	
Lab Safety 1-800-356-0783	Adjustable height tool stools (with and without backrests)	\$199	 
C&H 1-800-558-9966		\$156	
Grainger		\$203	
Alimed 1-800-225-2610		\$19-\$40	

- ∞ In order to easily transport equipment and reduce heavy lifting additional carts, hand trucks, and appliance dollies are recommended. A mechanical pushing device can be used to move large items through the hospital in order to reduce push/pull forces. Refer to vendor table 6.

Table 6: Carts			
Vendor	Description	Estimated Cost	Figure
Grainger	Akro-Mils utility cart	\$200	
Lab Safety 1-800-356-0783		\$325	
Peaklogix 703-819-6061	High Density Polyethylene Structural foam Portable WorkStation 45" x 24". 400 lb. capacity, 2 shelf unit with lip	\$195.30	
Grainger	Folding hand truck Three Position Hand Truck, Horizontal Load Capacity 750 Pounds, Vertical Load Capacity 500 Pounds, Noseplate Depth 7 1/2 Inches, Noseplate Width 18 Inches, Size 12 x 50 Inches, Truck Material Aluminum, Wheel 2/4, Overall Height 51 Inches, Overall Width 21 Inches, Height 40 Inches	\$466	
Lab Safety 1-800-356-0783	Wesco Aluminum Hand Truck, Load Capacity 175 Pounds, Wheel Rubber, Wheel Size 7 Inches, Overall Height 42 Inches, Overall Depth 19 Inches, Overall Width 19 Inches, Folding	\$261	
Lab Safety 1-800-356-0783	Collapsible Hand Truck 2 Wheel capacity 600 lbs. 4 wheel capacity 1,200 lbs.	\$275	

<p>Lab Safety 1-800-356-0783</p>	<p>Battery Powered Stair Climbing Appliance Truck, Lightweight Alloy, Load Capacity 850 Lbs, Half Horsepower 50 Amp 12 Volt DC Motor, Industrial Grade Gearbox, 6 Inch Diameter by 2 Inch Wide Mold On Rubber Wheel, 24 Inch by 4 Inch Noseplate, Overall Width 24 Inches, Depth 12 Inches, Height 72 Inches, Gray Silcon Alkyd Paint Finish, Includes; Battery Charger, Ratchet Belt Tightener w/ Auto Rewind, Non Marking Vinyl Contact Surfaces</p>	<p>\$1642</p>	
<p>Grainger</p>		<p>\$1869</p>	
<p>DJ Products 888 690 2278</p>	<p>CartCaddy Lite</p>	<p>\$4000</p>	
<p>Power Pusher 800.800.9274</p>	<p>Power pusher</p>	<p>\$5560 with batteries, hitch, and ergo handle</p>	
<p>Source Ergonomic 610-265-2620</p>			

- ∞ Anti-fatigue matting or sole inserts for standing work areas can reduce fatigue. If the worker remains in a confined area, anti-fatigue matting is a durable and efficient way to reduce fatigue. If the operator regularly leaves their workstation or spends much of their time walking, sole inserts may be a better option. Many theories exist as to why floor matting may reduce segmental and whole body fatigue. Matting provides a soft, uneven surface that promotes an imperceptible anterior-posterior and lateral sway of the body (center of gravity, like an inverted pendulum). The sway or rocking relieves pressure on the bottom of the foot and aids circulation. Small, portable anti-fatigue matting can also be used to protect knees and shins during repair tasks to protect technicians from hard surfaces. Refer to vendor table 7.

Table 7: Anti-fatigue matting an inner soles			
Vendor	Description	Estimated Cost	Figure
Lab Safety 1-800-356-0783	Anti-Fatigue Matting	Price varies by size.	
Matting World 1-800-254-8557			
Safeworker* recommended by NADEP Jax 1-888-456-3372		18" X 36 " Extreme Standing Mat with Beveled strips \$43.46 3'X5' Extreme standing mat with bevel strips \$156	
Guard Industries *Recommended by NADEP Jax 1-314-534-6952	Inner soles	Body Cushion #3059 Hiker/casual insoles \$5.21	
Alimed 1-800-225-2610		\$19 a pair	

Polymer Dynamics 1-800-287-4466		\$10 a pair	
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- ∞ In order to reduce static muscle loading and awkward postures while using the phone, a headset is recommended. Contact your telecommunications experts to find a headset that is compatible with the current phone system. Plantronics is a recommended brand.

Naval Facilities Engineering Command
Job Requirements and Physical Demands Survey Results
Biomedical Equipment Repair

Summary

The Job Requirements and Physical Demands Survey (JR/PD) was administered to the employees of the Biomedical Equipment Repair Shop in January 2007. Information regarding the development, instruction, and validation of the JR/PD can be found at http://www.brooks.af.mil/afioh/Health%20Programs/ergonomics_jrpd.htm. The JR/PD is an ergonomics assessment tool endorsed by the Department of Defense Ergonomics Working Group and used by the tri-services to collection occupational health data. The JR/PD is a survey used to assess ergonomics related risk in the workplace.

The results of the JR/PD indicate that the Biomedical Equipment Repair Shop is an Ergonomics Problem Area (EPRA). The shop scored an Overall or Survey Priority Rank of **seven** (on a scale of 1 to 9), where nine has the highest priority for intervention. A score of five or greater indicates an Ergonomics Problem Area. The JR/PD assesses five distinct body regions: shoulder/neck, hand/wrist/arm, back/torso, leg/foot, and head/eye. Each body region has a priority scores which is based upon a combination of identified ergonomics risk factors and employee reported discomfort. All of the body regions except the head/eye had significant priority scores (5 or higher). A significant number of employees reported experiencing work-related pain or discomfort that does not improve when away from work and interferes with their ability to carry out non-work related activities. Fifty-five percent of the survey respondents have seen a health care provider within the last twelve months for pain or discomfort that he or she feels is related to the job. A significant number of employees also reported pre-existing Musculoskeletal Disorders (MSDs) as well as illnesses recognized as contributing factors, which places them at a higher risk of additional or more severe Work-Related Musculoskeletal Disorders (WMSDs).

Overall Priority Score

The results of the JR/PD indicate that the Biomedical Equipment Repair Shop is an ergonomics problem area with an overall priority score of **seven**. An overall priority score of five or greater establishes a task/job as an ergonomic problem area. The overall priority score is determined by selecting the highest body region score for the job which in this case is the shoulder/neck, hand/arm/wrist, back/torso, and leg/torso regions with scores of seven.

The overall priority score is used to determine which jobs or areas are associated with the most significant ergonomic risk. It is important to note that a high overall priority score (i.e. ergonomic problem area) does not necessarily mean that the risk of illness associated with a job or area is high. Rather a high rating indicates that the tasks expose workers to a considerable level of risk factors associated with WMSDs in comparison to jobs/tasks or areas that receive lower scores.

Demographics

Nine (workers/respondents) completed the JR/PD survey, resulting in a 50% response rate. The population demographics are contained in Table 1. Age is a contributing factor for the development of WMSDs.

Table 1: Population Demographics

Gender:	Male: 89%	Female: 0%
Group:	Civilian: 22%	Military: 67%
	78% between the ages of 31 and 40	
	11% between the ages of 41 and 50	

Note: Totals may not sum to 100% due to under-reporting. Totals may sum to over 100% due to rounding.

Priority Score

The JR/PD prioritizes five distinct body regions based upon a combination of ergonomics risk factors and discomfort. Workers indicate their duration of exposure for different ergonomics risk factors. Ergonomics risk factors include posture, force, frequency, repetition, vibration, contact stress, and restrictive personal protective equipment. The frequency and severity factors are combined to evaluate discomfort in each of the five body regions. Table 2 demonstrates the relationship between body region, discomfort, and risk for this job. The shaded body regions have significant priority scores.

Table 2 Body Region, Discomfort and Risk

		Body Regions				
		Shoulder/ Neck	Hand/Wrist/Arm	Back/ Torso	Leg/ Foot	Head/ Eye
Priority Score		7	7	7	7	1
Risk	Prevalence	100%	100%	100%	100%	89%
	Rating	High	High	High	High	High
Discomfort	Prevalence	56%	44%	56%	44%	22%
	Rating	Medium	Medium	Medium	Medium	Low

Risk Prevalence and Rating

The percentage of respondents exposed to specific ergonomics risk factors for a given body region, for longer than two hours per day, assesses the prevalence of risk. A low rating represents less than 30% prevalence, medium 31% to 60% and high is greater than 61% of the respondents have exposure of more than 2 hours per day. All of the body regions have high levels of reported risk.

Discomfort Prevalence and Rating

The terms fatigue, numbness, and pain categorize discomfort. The percentage of respondents and their discomfort ratings determine whether discomfort is prevalent among the workers. Combinations of frequency and severity that indicate significant discomfort prevalence are shown with asterisks in Table 3. Low ratings represent less than 30% prevalence, medium 31% to 60% and high is greater 61%. The shoulder/neck, hand/wrist/arm, back/torso, and leg/foot have medium levels of reported discomfort.

Table 3: Discomfort Matrix

FREQUENCY	SEVERITY		
	Mild	Moderate	Severe
Daily	*	*	*
Weekly		*	*
Monthly			*

The Priority Matrix in Table 4 determines the overall prioritization of specific body regions. The relationship between discomfort and risk factors determines priority rating from 1 to 9 for each body region. A priority score greater than four, indicated by an asterisk, is significant. The Overall Priority ranking for the HC Shop is equal to the highest body region priority value, which is an 7. All of the body regions except head/eye had significant scores (5 or greater).

Table 4 Priority Matrix

RISK FACTOR	DISCOMFORT		
	High	Medium	Low
High	9*	7*	4
Medium	8*	5*	2
Low	6*	3	1

Organizational Information

Organizational factors contribute to ergonomic stressors. The organizational score for this area was **medium**, which indicates job stress factors are of minimal concern. Survey respondents were asked if they understood their job responsibilities, if their workload was too heavy, if they are able to get pertinent information, if they received comments on performance, etc. Suggestions to improve stress associated with organizational factors include providing workers with more autonomy and improving discussion and feedback between workers and supervisors.

Physical Effort

The survey resulted in a perceived physical exertion score of **10.78**. Respondents were asked to describe the physical effort required of their job on a scale of 1 to 15 where one is no exertion at all and fifteen is maximal exertion. The higher the score, the greater the level of perceived physiological exertion. A value of 10 is hard indicating a physically demanding task.

Health Care Provider Score

According to the health care provider score, **5 (55%)** of the respondents reported having been to a health care provider in the last 12 months for pain or discomfort that he or she thinks is related to his job.

Recovery Time Score

44% of the respondents reported experiencing work-related pain or discomfort that does not improve when away from work overnight or over the weekend. A score above 30% is of high importance. Lasting pain/discomfort is an indicator of inadequate recovery time for the muscles, tendons, and ligaments. Muscles, tendons, and ligaments that do not recover are more likely to be injured. Significant discomfort is apparent in the workers' inability to recover after the cessation of work.

Activity Interruption Score

67% of the respondents indicated that in the past 12 months, work-related pain or discomfort has caused difficulty in carrying out normal activities (e.g. job, hobby, leisure, etc.). A score above 50% is of high importance.

Previous Diagnosis Score

The survey asks if "a health care provider ever told you that you have any of the following conditions which you think might be related to your work?"

Tendonitis/Tenosynovitis	Ganglion Cyst
Trigger Finger,	Epicondylitis (Tennis Elbow)
Bursitis	Carpal Tunnel Syndrome
Thoracic Outlet Syndrome	Back Strain, Knee or Ankle Strain
Overuse Syndrome"	

56% of respondents indicated affirmatively. Pre-existing WMSDs can contribute to an employee's pain and discomfort levels; thereby affecting the overall priority score. Working conditions may exacerbate a pre-existing disorder. Workers with pre-existing WMSDs are likely to experience additional or more severe WMSDs if the environment is unchanged.

Contributing Factors

Respondents were asked if they had ever had one or more of the following conditions:

Wrist Fracture	Hypertension	Kidney Disorders
Thyroid Disorders	Diabetes	Gout
Rheumatoid Arthritis		

33% of the respondents indicated positively. These health conditions are contributing factors and may increase one's risk of developing a musculoskeletal disorder; thereby affecting overall priority.

Process Improvement Opportunities

This section of the survey allows employees to write in responses to questions. All statements are included exactly as written by the employees with the exception of spelling errors and expletives.

1. Which tasks are the most awkward or require you to work in the most uncomfortable position?
 - ∞ Sitting at our work benches in uncomfortable chair, unaccommodating work benches trying to do our daily job. Too much wear and tear on to back or load on feet having to stand so as to help with to pain or discomfort.
 - ∞ Typing
 - ∞ Working on beds, portable tray units, centrifugals, working on big medical units.
 - ∞ Kneeling and bending down to work.
 - ∞ Work on floor when objects are too heavy for a bench.
 - ∞ Moving heavy equipment such as dental chairs.
 - ∞ Lifting overhead, pushing carts that are very low to the ground. Sitting for long periods in front of computer, constantly walking up and down stairs.
 - ∞ Lying on floor repairing beds, stretchers, exam chairs.
 - ∞ Work on beds, sterilizers, x-ray machines. Units that are close to the floor.
 - ∞ Working on patient beds while on your back. Sitting at awkward heights for computer work.

2. Which tasks take the most effort?
 - ∞ Daily or routine repairs on various equipment.
 - ∞ Screwing
 - ∞ Lifting some other medical equipments.
 - ∞ Moving heavy equipment.
 - ∞ Working on large equipment on floor.
 - ∞ Lifting heavy objects.
 - ∞ Walking up and down stairs. Reaching down into toolboxes.
 - ∞ Lifting, moving new heavy equipment, refrigerators, dental chairs, etc.
 - ∞ Working in tight spaces and working on some medical units where you have to sit and reach behind with a tool to unscrew something.
 - ∞ Odd angles and positions while working on medical equipment.

3. Are there any tools or pieces of equipment that are notoriously hard to work with?
 - ∞ Beds
 - ∞ Surgical lights requiring to work overhead or use ladders.
 - ∞ RAMVAC vacuum compressors are very heavy and do not have wheels so they must be lifted to transport.
 - ∞ Screwdrivers that are very hard and the grip tears the hand because of the plastic they use and shape <causes> hand fatigue. Xcelite Jensen.
 - ∞ Screwdrivers- they are non-insulated when we work on high voltage items.

4. If you could make any suggestions that would help you do your job more easily or faster or better, what would you suggest.
- ∞ Better work benches, electro.
 - ∞ Tool boxes with wheels for travel to out line clinics.
 - ∞ Chair that's comfortable.
 - ∞ More variety of tools.
 - ∞ Jack stands, hydraulic lifts to elevate equipment – provide stable support while performing repairs.
 - ∞ It would be better if we had bigger, wider, areas for our workspaces. The small areas get cluttered very easily. Also, it would make our jobs easier if we had a portable method of checking work orders and communications- i.e palm pilots with internet, email, and phone because we are always on the road.
 - ∞ Better hand tools that do not fatigue the hands and something that lets you place things on top <of themselves> easier. Cart stools for low working.
 - ∞ Insulated hand tools, carts for test equipment, stools (low profile).

End Notes:

ⁱ Equipment purchase without proper and repeated training will not mitigate risk and may in fact increase hazards.

ⁱⁱ Administrative controls are management-controlled work practices and policies designed to reduce exposures to work-related musculoskeletal disorders (WMSDs) hazards by changing the way work is assigned or scheduled. Administrative controls reduce the exposure to ergonomic stressors and thus reduce the cumulative dose to any one worker. Examples of administrative controls that used in the ergonomics context include employee rotation, employer-authorized changes in the pace of work and team lifting. Reference OPNAVINST 5100.23G chapter 2307(h).

ⁱⁱⁱ This report does not constitute an endorsement of any particular product. Rather, it is a recitation of how Navy personnel have addressed a particular work place safety issue. Neither the Navy nor its employees and agents, warrant any product described in this report for any use, either general or particular.