

CASE STUDY - 4 Monitoring Visual Display (Vigilance)

TASK TITLE: Monitoring

Task Description:	<p>Monitoring involves the use of a monitor or series of monitors, keyboard (conventional), mouse (conventional) and a telephone. The length of time spent monitoring varies significantly for monitoring tasks as well as the type of work which is typically performed. Information used for the task typically comes from the monitor. Periodically required information will come from systems manuals.</p> <p>Typical jobs in which monitoring is performed include:</p> <ul style="list-style-type: none">• weather station• radar control
Job Performance Measures Most often impacted by Monitoring:	Error rates
Typical Employee Comments about Monitoring:	Employees typically complain about discomfort and/or stiffness in the hands/wrists, arms, shoulders/neck, and head/eyes.
Suggested Level II Analysis:	Postural analysis, light level analysis.

Case Study 4 (continued)

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact drop On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
1. Arms held away from body	<ul style="list-style-type: none"> Keyboard too high.  <p>Figure 4.1</p>	85. Raise chair: <ul style="list-style-type: none"> set the height of the chair so that the person's elbows are at the same height as the keyboard or mouse; a footrest may be required to support the person's feet. 	✓		low	low	low
		30. Lower keyboard tray or work surface: set the height of the keyboard/mouse support surface so that the person's elbows are at the same height as the keyboard.	✓		low to med.	low	med.
	<ul style="list-style-type: none"> Chair positioned too far away 	33. Move chair closer to work surface.	✓		low	low	low
	<ul style="list-style-type: none"> Arms of chair prohibit moving chair closer to desk  <p>Figure 4.2</p>	90. Remove or lower armrests: <ul style="list-style-type: none"> remove or adjust armrests, pencil drawers or other obstructions if they prevent the person from moving close enough to the workstation. 	✓		low to med.	low	med
		78. Provide proper chair: <ul style="list-style-type: none"> provide a chair in which the armrests can be adjusted or removed. 		✓	med	low	low

Case Study 4 (continued)

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> Lack of a place to rest the hands  <p>Figure 4.3</p> <ul style="list-style-type: none"> Lack of leg clearance under desk Mouse positioned too high  <p>Figure 4.4</p>	<p>36. Move keyboard forward so forearms rest evenly on surface:</p> <ul style="list-style-type: none"> if work surface is deep enough, this is simply a matter of pushing the keyboard back on the work surface; if the work surface depth is restricted, providing this space would require using a different work surface for computer work. <p>89. Remove clutter from under work surface.</p> <p>85. Raise chair:</p> <ul style="list-style-type: none"> set the height of the chair so that the person's elbows are at the same height as the mouse; a footrest may be required to support the person's feet. <p>30. Lower keyboard tray or work surface:</p> <ul style="list-style-type: none"> set the height of the mouse support surface so that the person's elbows are at the same height as the mouse. 	<p>✓</p>	<p>✓</p>	<p>low</p> <p>med.</p> <p>low</p> <p>low to med.</p>	<p>low</p> <p>low</p> <p>low</p> <p>low</p>	<p>low</p> <p>med.</p> <p>low</p> <p>med.</p>

Case Study 4 (continued)

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> • Mouse not positioned next to keyboard  <p style="text-align: center;">Figure 4.5</p>	<p>63. Position mouse next to keyboard:</p> <ul style="list-style-type: none"> • provide a work surface that allows the mouse and keyboard to be placed side by side and at the same height; • position mouse and keyboard so the forearm can be rested on the work surface while keying and mousing. 	✓		low to med.	low	low
	<ul style="list-style-type: none"> • Keyboard tray used with mouse placed on desk  <p style="text-align: center;">Figure 4.6</p>	<p>17. Install larger keyboard tray:</p> <ul style="list-style-type: none"> • replace the current keyboard tray with a tray which accommodates a mouse/input device and a keyboard. 		✓	med.	low	med.
	<ul style="list-style-type: none"> • Items used frequently not positioned close to the body 	<p>49. Place keyboard and mouse on work surface:</p> <ul style="list-style-type: none"> • provide a work surface which is large enough to support a keyboard and mouse. 		✓	med.	low	med.
		<p>35. Move item in work zone:</p> <ul style="list-style-type: none"> • items which are used every few minutes or more should be placed close to the body. 	✓		low	low	med.

Case Study 4 (continued)

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
2. Repeated reaching	<ul style="list-style-type: none"> Reaching for items too far from body  <p>Figure 4.7</p>	35. Move items in work zone.	✓		low	low	med.
3. Shrugging: working with the shoulders shrugged	<ul style="list-style-type: none"> Keyboard too high Chair positioned too low Drawer under work surface restricts chair height 	30. Lower keyboard tray or work surface: <ul style="list-style-type: none"> set the height of the work surface so that the person's elbows are at the same height as the keyboard. 	✓	✓	low to med.	low	med.
		85. Raise chair: <ul style="list-style-type: none"> set the height of the chair so that the person's elbows are at the same height as the keyboard or mouse; Note: in some cases, a footrest will be required in order to support the person's feet. 	✓		low	low	low
		71 Provide alternative work surface: <ul style="list-style-type: none"> remove drawer; provide a workstation without obstructions under the work surface (e.g., pencil drawers or structural brackets). 	✓	✓	med.	low	med.

Case Study 4 (continued)

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> Person has tendency to tense the shoulders while working 	23. Incorporate health comfort strategies: <ul style="list-style-type: none"> encourage the person to relax while working <ul style="list-style-type: none"> – breath frequently – alternate tasks – stretch – take rest pauses 95. Train proper body mechanics/posture: <ul style="list-style-type: none"> encourage the person to let the shoulders down and relax while keying. 	✓		low	low	med.
			✓		low	low	med.
4. Repeated arm forces	<ul style="list-style-type: none"> Rarely occurs 	N/A					
5. Holding/carrying materials	<ul style="list-style-type: none"> Rarely occurs 	N/A					
6. Cradling the telephone between the neck and shoulder	<ul style="list-style-type: none"> Talking on the telephone (using a hand set) while both hands are occupied (e.g., keying or doing paper work) 	83. Provide telephone headset: <ul style="list-style-type: none"> provide a selection of head set types to choose from (e.g., over-the-head, over-the-ear). 		✓	med.	med.	med.

Case Study 4 (continued)

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
			✓		low	med.	med.
	<ul style="list-style-type: none"> • Monitor positioned too low  <p>Figure 4.8</p>	101. Use an available telephone headset. 59. Position monitor just below eye level: <ul style="list-style-type: none"> • raise the monitor; • monitor should be positioned such that the top of the screen is between 0-4" (0-10.16 cm) below eye height; • use a monitor riser, CPU/hard drive, or other stable surface to position monitor at the correct height. 	✓		low	low	med.
	<ul style="list-style-type: none"> • Monitor positioned too high  <p>Figure 4.9</p>	59. Position monitor just below eye level: <ul style="list-style-type: none"> • lower the monitor; • monitor should be positioned such that the top of the screen is between 0-4" (0-10.16 cm) below eye height; • use a monitor riser, CPU/hard drive, or other stable surface to position monitor at the correct height. 	✓		low	low	low
				✓	low	low	low

Case Study 4 (continued)

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
7. Head Bent down, up, or neck twisted	<ul style="list-style-type: none"> • Monitor and keyboard not aligned  <p>Figure 4.10</p> <ul style="list-style-type: none"> • Monitor greater than 30" inches from eye causes the person to lean forward to read monitor 	<p>61. Position monitor in front of body: position monitor so that it is directly behind the keyboard (this allows the body to be in alignment and prevents twisting of the neck);</p> <ul style="list-style-type: none"> • provide a work surface that is deep enough to support the keyboard and the monitor screen. For large monitors, this indicates a work surface which is at least 30" (76.2 cm) deep; • provide a work surface that is large enough for computer and paper tasks; • use of keyboard trays and monitor support arms can be used in some situations, however, they often have unwanted side effects. <p>34. Move items closer to body:</p> <ul style="list-style-type: none"> • position monitor between 18 and 30" (45.72cm - 76.2cm) from eyes; • 22"-24" (55.88cm - 60.96cm) is a good distance for many people. 	<p>✓</p>	<p>✓</p>	<p>low</p> <p>med. to high</p> <p>low</p>	<p>med.</p> <p>med.</p> <p>med. to high</p>	<p>med.</p> <p>med.</p> <p>med.</p>

Case Study 4 (continued)

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> Uncorrected visual disorders cause the person to lean forward to read monitor or documents Individual wears bifocals 	6. Check eyes and correct for visual disorders: <ul style="list-style-type: none"> encourage person to have visual disorders corrected. 6. Check eyes and correct for visual disorders: <ul style="list-style-type: none"> provide monofocal or tri-focal computer glasses. 	✓		med. to high	med. to high	high
		59. Position monitor directly on the work surface: <ul style="list-style-type: none"> for bifocal users, place monitor directly on the work surface or a bit higher so that the head is upright not tilted back (ensure that this does not cause glare problems. If it does, computer glasses may be a better solution). 		✓	med. to high	med.	med.
	<ul style="list-style-type: none"> Multiple monitors used. 	61. Position monitor in front of body: <ul style="list-style-type: none"> prioritize the location of monitors based on importance and frequency of use; place most important and most frequently used monitors in front of the body. 	✓		low	med	med
					low	med.	med.

Case Study 4 (continued)

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		59. Position monitor directly on the work surface: <ul style="list-style-type: none"> • prioritize the location of monitors based on importance and frequency of use; • place most important and most frequently used monitors so the top of the screen is between 0-4' below eye height. 		✓	low	med	med

Case Study 4 (continued)

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
8. Bent wrists	<ul style="list-style-type: none"> • Keyboard/typewriter too high • Work surface too high • Keyboard is above elbow height 	30. Lower work surface/keyboard tray: <ul style="list-style-type: none"> • if the work surface/keyboard tray is adjustable in height, set the height of the keyboard/mouse support surface so that the person's elbows are at the same height as the keyboard/mouse; • this is the preferred strategy because it doesn't require a foot rest. 	✓	✓	low to high	low	med.
		85. Raise chair: <ul style="list-style-type: none"> • set the height of the chair so that the person's elbows are at the same height as the keyboard or mouse; • This strategy is best when the work surface is not easily adjustable in height; • a footrest may be required to support the person's feet. 	✓		low	low	low

Case Study 4 (continued)

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> • Keyboard/typewriter too low • Keyboard is below elbow height when chair height is adjusted so that the person's feet are flat on the floor 	87. Raise keyboard or work surface: <ul style="list-style-type: none"> • if the work surface/keyboard tray is adjustable in height, set the height of the keyboard/mouse support surface so that the person's elbows are at the same height as the keyboard/mouse; • if the work surface is not adjustable in height, try raising the entire workstation with risers. This works best for free standing furniture but often does not work for modular furniture; • this is the preferred strategy because it doesn't require a foot rest. 	✓	✓	low	low	med.
	<ul style="list-style-type: none"> • Keyboard is sloped towards the person 	49. Place keyboard and mouse on work surface: <ul style="list-style-type: none"> • lower the feet on the back of the keyboard; • adjust the keyboard support surface so the keyboard is flat and level. 	✓		low	low	med.

Case Study 4 (continued)

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact drop On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> Person rests wrists on front edge of the keyboard or the work surface immediately in front of the keyboard 	96. Train proper keying style: <ul style="list-style-type: none"> encourage person to maintain straight wrists while keying; encourage person to keep wrists free while keying ; encourage person to avoid bending the wrists while resting the hands. 	✓		low	med.	med.
		18. Install palm rest: <ul style="list-style-type: none"> a palm rest can provide a comfortable place to rest when not keying and encourages neutral wrist posture; 	✓		low	med.	med.

Case Study 4 (continued)

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact drop On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> Person constantly rests wrists on the wrist rest while keying 	96. Train proper keying style: <ul style="list-style-type: none"> encourage person to maintain straight wrists while keying; encourage person to keep wrists free while keying; encourage person to use arm movement to move around on the keyboard rather than a wrist movement; encourage person to avoid bending the wrists while resting the hands; rest hands in lap or on arm rests while pausing. 	✓		low	med.	med.
		18. Install palm rest: <ul style="list-style-type: none"> a palm rest can provide a comfortable place to rest when not keying and encourages neutral wrist posture; generally, a palm rest which is approximately the same height as the keys will achieve this. 	✓		low	low	low

Case Study 4 (continued)

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact drop On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> Leaning forward while keying or using the mouse Position of mouse in relation to keyboard Mouse is too far away from body 	<p>95. Train proper body mechanics:</p> <ul style="list-style-type: none"> encourage person to rest the back against the back rest while keying or using the mouse; this reduces the tendency to bend the wrists back while keying or using the mouse. <p>107. Use keyboard tray that accommodates mouse, keyboard, and palm support.</p> <p>63. Position mouse next to keyboard:</p> <ul style="list-style-type: none"> position the mouse directly adjacent to the keyboard and at approximately the same height as the keyboard; position mouse and keyboard so the forearm can be rested on the work surface while keying and mousing. 	✓		low	med.	med.
				✓	low to med.	med.	med.
			✓		low	low	low
	 <p>Figure 4.11</p> <ul style="list-style-type: none"> Using wrist movement to move mouse rather than arm movement 	<p>95. Train proper body mechanics posture:</p> <ul style="list-style-type: none"> encourage person to use a forearm movement to move the mouse rather than a wrist movement. 	✓		low	low	low

Case Study 4 (continued)

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact drop On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
9. Repeated wrist movements	<ul style="list-style-type: none"> Rarely occurs 	N/A					
10. Repeated finger movements	<ul style="list-style-type: none"> Keying/typing speed and length of task Length of task without a work break 	67. Program macro keys to reduce keying: <ul style="list-style-type: none"> macros are small programs that can be useful for highly repetitive keying or mousing actions. 	✓		low	high	high
		95. Train proper body mechanics posture: <ul style="list-style-type: none"> encourage the person to avoid rushing. 	✓		low	low	low
		13. Incorporate health comfort strategies: <ul style="list-style-type: none"> encourage the person to relax while working <ul style="list-style-type: none"> – breath frequently – alternate tasks – stretch – take rest pause 	✓		low	med.	med.
		88. Redesign job: <ul style="list-style-type: none"> adjust job activities to distribute keying activities throughout the day; break up continuous keying and mousing tasks with other types of tasks. 	✓	✓	low to med.	med.	med.
						low	med

Case Study 4 (continued)

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact drop On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
11. Hyper-extension of finger/thumb	<ul style="list-style-type: none"> • Small input device (e.g., track ball, glide point) requires single finger activation • Person has tendency to hyperextend fingers or thumbs while keying 	15. Install alternative mouse: <ul style="list-style-type: none"> • provide a full-size input device such as a mouse or large track-ball. 		✓	low to high	low	med.
		98. Train proper mousing style: <ul style="list-style-type: none"> • encourage person to avoid extending fingers while mousing or keying; • encourage person to keep all of the fingers curled under and together. 	✓		low	low	low
12. Hand forces	<ul style="list-style-type: none"> • Person tends to hit keys hard • Person tends to place a heavy grip on mouse or click mouse buttons hard • Keys are stiff 	96. Train proper keying style: <ul style="list-style-type: none"> • encourage person to practice using as light a touch as possible on keys and buttons. 	✓		low	low	low
		98. Train proper mousing style: <ul style="list-style-type: none"> • encourage person to practice keeping a light grip on the mouse. 	✓		low	low	low
		22. Investigate use of alternative keyboard: <ul style="list-style-type: none"> • provide a keyboard with keys which do not require excessive forces to actuate; • keys should provide adequate auditory and tactile feedback when actuated. 		✓	med. to high	med.	med.

Case Study 4 (continued)

Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact drop On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> • Mouse buttons are stiff 	15. Install alternative mouse: <ul style="list-style-type: none"> • provide a mouse with buttons which do not require excessive forces to actuate. 		✓	med. to high	med.	med.
	<ul style="list-style-type: none"> • Lack of appropriate tactile feedback (“click”) 	22. Investigate use of alternative keyboard: <ul style="list-style-type: none"> • keys should provide adequate auditory and tactile feedback when actuated. 		✓	low to high	med.	med.
		15. Install alternative mouse: <ul style="list-style-type: none"> • mouse buttons should provide adequate auditory and tactile feedback when actuated. 		✓	med to high	med	med

Case Study 4 (continued)

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
13. Hard edges	<ul style="list-style-type: none"> • Wrists rest on edge of work surface (See Figures 4.12 and 4.13) <p style="text-align: center;">Figure 4.12</p>  <p style="text-align: center;">Figure 4.13</p> 	<p>85. Raise chair:</p> <ul style="list-style-type: none"> • set the height of the chair so that the person's elbows are at the same height as the keyboard or mouse; • a footrest may be required to support the person's feet. 	✓		low	low	low
		<p>30. Lower keyboard tray or work surface:</p> <ul style="list-style-type: none"> • set the height of the keyboard/mouse support surface so that the person's elbows are at the same height as the keyboard. 	✓		low to med	low	med
		<p>36. Move keyboard forward so forearms rest evenly on surface:</p> <ul style="list-style-type: none"> • this reduces the tendency to rest the wrists/forearms on the hard edge; • if the work surface depth is restricted, providing this space would require using a different work surface for computer work. 	✓		low	low	low
						✓	med

Case Study 4 (continued)

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
			✓	✓		Quality	Productivity
		18. Install palm rest: <ul style="list-style-type: none"> the hard edge can be eliminated by attaching a rounded edge to the front edge of the work surface. This option is generally preferred over the use of a palm rest; a palm rest can provide a comfortable place to rest when not keying and encourages neutral wrist posture; a palm rest is not recommended for a mouse because it results in awkward wrist movements. 	✓		low	med	med
	<ul style="list-style-type: none"> Work surface is not deep enough to provide a place to rest the hands in front of the keyboard 	107. Use keyboard tray that accommodates mouse, keyboard, and palm support.		✓	high	med	med
	<ul style="list-style-type: none"> Hard arm rests 	77. Provide larger work surface. 94. Train worker to properly adjust chair: <ul style="list-style-type: none"> attach padding to the armrests to eliminate exposure to hard edges. 	✓		low	low	low

Case Study 4 (continued)

Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		78. Provide proper chair • provide a chair with padded armrests.		✓	med	low	low
14. Repeated forearm rotation	• Rarely occurs	N/A					

Case Study 4 (continued)

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
15. Leaning forward or poor lower back posture	• Monitor too far from eyes	58. Position monitor 18" - 30" (45.72-76.2cm) from the eyes: <ul style="list-style-type: none"> • 22"-24" (55.88cm - 60.96 cm) is a good distance for many people. 	✓		low	med	med
	• Text is difficult to read	12. Improve character sizes and style on document and monitor: <ul style="list-style-type: none"> • increase font size of text; • font size of at least 12 point are recommended for screen distances of 18"-30" (45.72-76.2 cm); • font sizes of greater than 12 point is recommended for screen distances of greater than 30" (76.2 cm). 	✓		low	med	med
	• Person has a habit of leaning forward while working	95. Train proper body mechanics: <ul style="list-style-type: none"> • encourage person to rest the back against back rest and sit back and relax while working; • encourage person to push his or her chair toward the workstation in order to reduce the tendency to lean forward. 	✓		low	med	med

Case Study 4 (continued)

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> Inappropriate chair adjustment 	94. Train worker to properly adjust: <ul style="list-style-type: none"> adjust back rest to support lower back; pull chair forward and lean back while working; attach a small pillow to back rest to support lower back. 	✓		low	med	med
	<ul style="list-style-type: none"> Inadequate chair 	78. Provide proper chair: <ul style="list-style-type: none"> provide a chair with a back rest; provide a chair with adequate lower back support. 		✓	med to high	med	med
	<ul style="list-style-type: none"> Chair arms interfere with moving chair closer 	90. Remove or lower armrests: <ul style="list-style-type: none"> remove or adjust armrests, pencil drawers or other obstructions if they prevent the person from moving close enough to the workstation. 	✓		low to med	med	med
		78. Provide proper chair: <ul style="list-style-type: none"> provide a chair in which the armrests can be adjusted or removed. 		✓	med to high	med	med

Case Study 4 (continued)

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> • Seat pan on chair is too deep 	<p>75. Provide back support:</p> <ul style="list-style-type: none"> • attach a pillow to back rest to decrease the seat pan depth and support the lower back; • provide a chair with an adequate/adjustable seat pan depth and adequate lower back support. 	✓		low to med	med	med
	<ul style="list-style-type: none"> • Inadequate foot support causes person to not lean against back rest • Chair is too high and causes person not lean against back rest 	<p>81. Provide footrest:</p> <ul style="list-style-type: none"> • provide a footrest which allows both the heels and toes to be supported; • a footrest can be a purchased item) ; • a box or several ring binders taped securely together can also be used; • a footrest of one height may not be appropriate for all sized individuals or workstations (footrests within several heights or are adjustable in height are preferred); • a footrest should be large enough to allow the feet to move freely (a size of 16" x 20" (40.64 cm X 50.8 cm) is recommended). 		✓	med to high	med	med
					low to med	low	low

Case Study 4 (continued)

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
			✓	✓			
	<ul style="list-style-type: none"> Multiple monitors used 	<p>28. Lower chair:</p> <ul style="list-style-type: none"> adjust the chair height so that the person's heels and toes can both rest comfortably on the floor or other foot rest; care must be given to ensure that adjusting the chair for the feet does not cause problems for the hands, wrists, and arms. <p>61. Position monitor in front of body:</p> <ul style="list-style-type: none"> prioritize the location of monitors based on importance and frequency of use; place most important and most frequently used monitors in front of the body. <p>59. Position monitor directly on the work surface:</p> <ul style="list-style-type: none"> prioritize the location of monitors based on importance and frequency of use; place most important and most frequently used monitors so the top of the screen is between 0-4' (0-10.16 cm) below eye height. 	✓		low	low	low
			✓		low	med	med
			✓		low	med	med

Case Study 4 (continued)

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
16. Repeated bending	<ul style="list-style-type: none"> Reaching for items too far from body  <p>Figure 4.14</p>	35. Move items in work zone.	✓		low	med	med
17. Lifting forces	<ul style="list-style-type: none"> Rarely occurs 	N/A					
18. No foot support	<ul style="list-style-type: none"> Chair too high Feet are unsupported. 	28. Lower chair: <ul style="list-style-type: none"> adjust the chair height so that the person's heels and toes can both rest comfortably on the floor or other foot rest; ensure that adjusting the chair for the feet does not cause problems for the hands, wrists, and arms. 	✓		low	low	low
		76. Provide footrest: <ul style="list-style-type: none"> provide a footrest which allows both the heels and toes to be supported; a footrest can be a purchased item or a box or several ring binders taped securely together; a footrest of one height may not be appropriate for all sized 	✓		low to med	low	low

Case Study 4 (continued)

Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		individuals or workstations (footrests within several heights are adjustable in height are preferred); <ul style="list-style-type: none"> • a footrest should be large enough to allow the feet to move freely (a size of at least 16" x 20" (40.64 cm X 50.8 cm) is recommended). 					

Case Study 4 (continued)

Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
19. Edge of seat or work surface presses into legs	<ul style="list-style-type: none"> Feet are not supported 	<p>76. Provide footrest:</p> <ul style="list-style-type: none"> a footrest can support the feet and simultaneously reduce pressure on the back of the leg; a footrest can be a purchased item or a box or several ring binders taped securely together; a footrest of one height may not be appropriate for all sized individuals or workstations (footrests within several heights are adjustable in height are preferred); a footrest should be large enough to allow the feet to move freely (a size of at least 16" x 20" (40.64 cm X 50.8 cm) is recommended). 	✓		low to med	low	low



Figure 4.15

Case Study 4 (continued)

Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		28 Lower chair: <ul style="list-style-type: none"> adjust the chair height so that the person's heels and toes can both rest comfortably on the floor or other foot rest; ensure that adjusting the chair for the feet does not cause problems for the hands, wrists, and arms. 	✓		low	low	low
	• Seat pan has a hard front edge	94. Train worker to properly adjust chair: <ul style="list-style-type: none"> provide a cushion for the seat pan to prevent contact with hard edge. 	✓		med	low	low
		78. Provide proper chair: <ul style="list-style-type: none"> provide a chair with a rounded front edge on the seat pan. 		✓	med to high	low	low
	• Seat pan too long	75. Provide back support: <ul style="list-style-type: none"> attach a pillow to back rest to decrease the seat pan depth and support the lower back; provide a chair with an adequate/adjustable seat pan depth and adequate lower back support. 	✓		med	low	low
				✓	med to high	med	med

Case Study 4 (continued)

Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> Obstructions under work surface interfere with leg clearance and expose person to hard edges: <ul style="list-style-type: none"> pencil drawers; keyboard trays; or structural supports. 	89. Remove clutter from under work surface: <ul style="list-style-type: none"> eliminate obstructions; remove pencil drawers; replace problem keyboard trays with trays that do not expose person to hard edges. 		✓	low to high	med	med
20. Hard floor surfaces	<ul style="list-style-type: none"> Rarely occurs 	N/A					
21. Kneeling/squatting	<ul style="list-style-type: none"> Rarely occurs 	N/A					

Case Study 4 (continued)

Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
22. Staring at screen or document	<ul style="list-style-type: none"> Length of work task without a change of position for the eyes 	46. Periodically look away from screen.	✓		low	low	low
		13. Incorporate health comfort strategies: <ul style="list-style-type: none"> encourage the person to relax while working <ul style="list-style-type: none"> – breath frequently – alternate tasks – stretch – take rest pause 	✓		low	low	low
23. Glare	<ul style="list-style-type: none"> Glare directly from a light source (e.g., looking towards an uncovered window) Glare from an uncovered window reflected off monitor or other shiny surfaces 	53. Place the monitor perpendicular to the window.		✓	low to med	med	med
		8. Close blinds or curtains: <ul style="list-style-type: none"> provide window coverings if not available. 	✓		low	low	low



Figure 4.16

Case Study 4 (continued)

Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> • Glare directly from a light source: looking towards an overhead light • Glare from an overhead or task light reflected off monitor or other shiny surfaces 	<p>60. Position the monitor between rows of overhead lights:</p> <ul style="list-style-type: none"> • position monitor so that no overhead lights are visible directly above the monitor when looking at the screen; • place the workstation so that it faces a wall or partition. 		✓	low to med	med	med
	 <p>Figure 4.17</p>	<p>31. Lower light levels:</p> <ul style="list-style-type: none"> • remove pairs of fluorescent light bulbs from overhead fixtures. Note: this should be done with the assistance of appropriate technical assistance and the agreement of co-workers in the area. 		✓	low to med	med	med
		<p>20. Install parabolic louvers to direct light down on the surface:</p> <ul style="list-style-type: none"> • provide alternative light fixtures for overhead lights (parabolic louver fixtures are recommended when computer work is the predominant activity.) Note: this should be performed by the appropriate personnel. 		✓	high	med	med
		<p>79. Provide screen hood/visor.</p>		✓		low	med
		<p>93. Tilt monitor down so that the</p>					

Case Study 4 (continued)

Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		screen is vertical.	✓		low	med	med
	<ul style="list-style-type: none"> Task light shines into eyes  <p>Figure 4.18</p>	9. Cover or turn out under-cabinet lighting: <ul style="list-style-type: none"> cover the task light to prevent it from shining into eyes. 40. Move monitor out from under-cabinet lighting. 10. Direct task light away from screen and eyes: <ul style="list-style-type: none"> if necessary, provide a more easily adjustable task light. 	✓		low	low	low
			✓		low	low	low
			✓		low	med	med
			✓		low	low	low

Case Study 4 (continued)

Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
24. Light levels	<ul style="list-style-type: none"> Light levels too high around monitor Light level too low to read document 	31. Lower light levels: <ul style="list-style-type: none"> turn off task light; 20-50 fc is an appropriate range of light levels for computer tasks; remove pairs of fluorescent light bulbs from overhead fixtures. Note: this should be done with the assistance of appropriate technical assistance and the agreement of co-workers in the area; provide alternative light fixtures for overhead lights (parabolic louver fixtures are recommended when computer work is the predominant activity.) Note: this should also be performed by the appropriate personnel; if light levels for the monitor are adjusted appropriately, it may still be necessary to increase light levels for paper tasks using a task light/desk lamp. 	✓	✓	med to high	med	med

Case Study 4 (continued)

Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		82. Provide task light: <ul style="list-style-type: none"> • provide task light (50-100 fc is an appropriate range of light levels for reading tasks); • increase overall light levels to meet the lighting needs of computer and paper tasks (50 fc is an appropriate light level where both computer and paper tasks are performed). 	✓	✓	low to med	med	med
25. Screen Distance	<ul style="list-style-type: none"> • Monitor positioned too close to eyes • Not enough work surface space to position monitor far enough away from person. • Monitor positioned too far from eyes 	58. Position monitor 18" -30" (45.72-76.2 cm) from the eyes: <ul style="list-style-type: none"> • 22"-24" (55.88-60.96 cm) is a good distance for many people. 	✓		low	med	med
		52. Place monitor on alternative work surface.		✓	med	med	med
		58. Position monitor 18" -30" (45.72-76.2 cm) from the eyes: <ul style="list-style-type: none"> • 22"-24" (55.88-60.96 cm) is a good distance for many people. 	✓		low	med	med

Case Study 4 (continued)

Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> Uncorrected visual disorders 	6. Check eyes and correct for visual disorders: <ul style="list-style-type: none"> provide computer glasses for person's who need bifocals, provide monofocal or tri-focal computer glasses. 		✓	med to high	med	med
26. Difficult to read	<ul style="list-style-type: none"> Font/character size too small to read on computer screen 	12. Improve character size and style on document and monitor: <ul style="list-style-type: none"> increase font size of text; font size of at least 12 point is recommended for screen distances of 18"-30" (45.72-76.2 cm); font sizes of greater than 12 point are recommended for screen distances of greater than 30" (76.2 cm). 	✓		low	med	med
	<ul style="list-style-type: none"> Document text too small 	12. Improve character size and style on document and monitor: <ul style="list-style-type: none"> increase font size of text; font size of at least 12 point are recommended for screen distances of 18"-30" (45.72-76.2 cm); font sizes of greater than 12 point are recommended for screen distances of greater than 	✓		low	med	med

Case Study 4 (continued)

Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		30" (76.2 cm).					
	<ul style="list-style-type: none"> Document text hand written hard to read VDT screen dirty 	12. Improve character size and style on document and monitor: <ul style="list-style-type: none"> increase character size. 7. Clean screen regularly.		✓	low to high	med	med
			✓		low	med	med