TA4
Best Practices for Site-Wide Hospital Ergonomics

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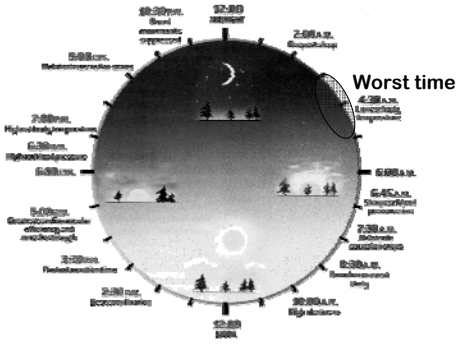
- Mark Hennessy, Mark Dohrmann and Partners Pty Ltd., Australia

Hospital Challenges

- Businesses in transition
- Focus on patient experience
- Constant expansion of services
- Healthcare cost containment
- Changing technologies
- Varied settings
- Emergency preparedness
- Aging and Growing Clientele
- Aging and Growing Employees
- 24 x 7 operation

We are Biological Clocks!



(Source: Wright, K. (2002) Times of our lives, Scientific American, 287 (3), 58-65.)

Good Design creates Good Ergonomics

- It's a lot simpler to change a line on a drawing than to alter a finished building!
  Mark Hennessy, Australia

- It's a lot simpler to choose the right equipment than to adapt the wrong equipment!
  Alan Hedge, USA

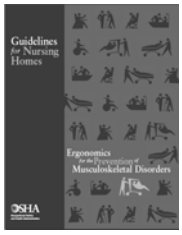
Ergonomics Programs
(NIOSH, 1997)

1. Look for signs of WMSDs
2. Establish:
   - Workplace Safety and Health Program
   - Management commitment
   - Worker Participation
3. Ergonomics Training (WMSDs, job analysis, controls)
4. Medical indicators and Ergonomic Risk Factors
5. Select, implement, evaluate controls
6. Responsibilities: employer, employee, HCP
7. Proactive vs. Reactive Ergonomics

http://www.cdc.gov/niosh/ephome2.html

Ergonomics in Hospitals

- OSHA has a guideline for nursing homes
- Hospitals have many more settings that need to be addressed ergonomics than do nursing homes.

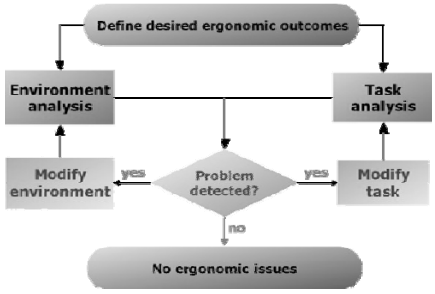


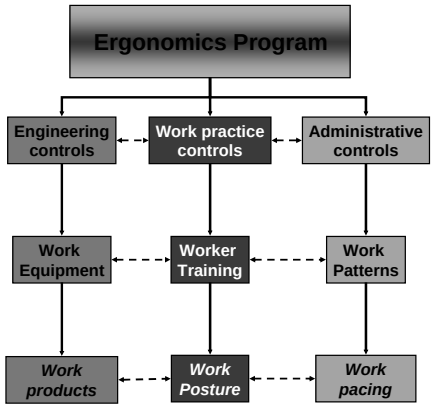
http://www.osha.gov/ergonomics/guidelines/nursinghome/

Hospital Settings

- Emergency rooms
- Waiting rooms
- Acute Care Treatment
- Long-term Care
- Kitchen and dining
- Environmental/custodial services
- Specialist departments e.g. Radiology
- Patient Accounts
- Operating rooms
- Pathology/Laboratories
- Grounds

Ergonomics as a Process





Hospital Ergonomics Plan

- Establish a written plan that:
  - Defines a mission statement
  - Defines key players and ergonomics process
  - Defines and prioritizes problems
  - Defines roles in equipment selection
  - Defines success benchmarks, specific targets and timeframe
  - Defines success measures and records keeping
  - Defines strategies and tactics for achieving success
  - Defines milestones and key reviews
  - Defines evaluation process for design changes
- Tools are available to assist with this, for example, OSHA eTools: http://www.osha.gov/SLTC/etools/hospital/hazards/ergo/ergo.html

Planning Example

- P.I.E. - Partners in Ergonomics
- Purpose
  - P.I.E. - Preventing Injuries Everyday
  - MISSION STATEMENT:
    - "The P.I.E . (Partners in Ergonomics) at Finger Lakes Health will foster ergonomic safety through the review of all work stations. We will encourage employees; through education, to minimize preventable injuries and musculoskeletal disorders."
    - Source: Lisa Lang <lisa.lang@flhealth.org> http://www.flhealth.org/

Key players and ergonomics process

- Management (Administration, physicians etc.)
- Employees (Physicians, nurses, staff etc.)
- Experts (internal: ergonomists, physicians, nurses etc.)
- Experts (external: ergonomists)
- Ancillary Users (emergency services, delivery services etc.)
- Users (patients, visitors etc.)
- Process leaders
- Process participants

Planning Example

- FingerLakes Health Plan
  - Active Management Leadership
  - Employee Participation
  - Job Hazard Analysis and Control
  - Training of Managers, Supervisors, Employees
  - Implementation of Controls
  - Program Evaluation
    - Source: Lisa Lang <lisa.lang@flhealth.org>

Creating a participatory ergonomics process

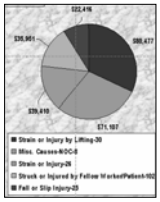
- Participatory ergonomics means training people, providing them with appropriate tools, and empowering them to practice good ergonomics.
- Training can involve:
  - Train-the-trainer
  - User-ergonomics awareness training (Recognize MSDs risk factors, understand ergonomic controls and know the reporting procedure)
- Participation can be:
  - Full direct (All participants are stakeholders)
  - Partial direct (Champions)
  - Representative (Group representative)

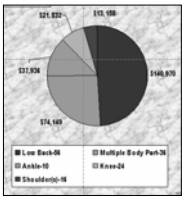
Define and prioritize problems

- Patient experience
- Medical errors
- Worker compensation costs
- Employee injuries
- Employee turnover
- Employee absenteeism
- Employee input
- Employee surveys
- Expert walkthrough audits

Planning Example

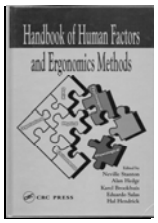
- Statistical analysis of injury data for specified time periods can show costs by type of injury, by body region, by hospital location, or frequency of injury by these variables etc.





Define success measures

- Ergonomic methods
  - Expert checklists
  - Interviews
  - Focus groups
  - MSD surveys
  - Rapid Upper Limb Assessment (RULA) evaluation method
  - Rapid Entire Body Assessment (REBA) evaluation method
  - Occupational Repetitive Actions (OCRA) evaluation method
  - NIOSH lifting analysis
  - Snook tables



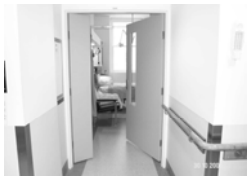
Evaluate the impact of design changes

- Ergonomic evaluations should always be undertaken to quantify impact of:
  - Changes in workers
  - Changes in equipment
  - Changes in furniture
  - Changes in environmental conditions
  - Changes in work demands

Hospital Examples of Ergonomic Design Issues and Opportunities

Inadequate Clearance Space

- Design options neglect the space needs for patient transfer actions.
- Narrow corridors and doorways, and poor doorway placement can restrict access.



Images: Courtesy of Mark Hennessy, Australia

Inadequate Corridor Space

- Avoid cluttering corridors.
- Remember hand rail depth!

Images: Courtesy of Mark Hennessy, Australia

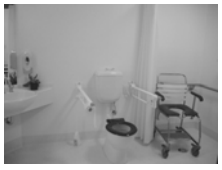
Inadequate Bathroom Space

- Design options may neglect the space needs for bending/lifting/patient transfer actions.

Images: Courtesy of Mark Hennessy, Australia

Bathroom Solutions

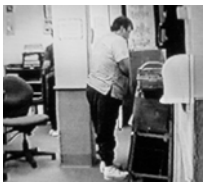
- Space either side of toilet with drop down support arms
- Space in front of toilet
- Toilet directly opposite door
- Door opens out, has hooks
- No door closers



Images: Courtesy of Mark Hennessy, Australia

Inadequate Access Space

- Design options neglect the space needs for bending/ lifting resulting in narrow corridors and restricted access.
- Encourages poor bending/lifting technique



Organize disorganized Storage

- Storage often crowded and disorganized.
- Storage - often difficult to access equipment such as stand lifts, sling lifts that require constant maintenance.
- Discourages equipment use, such as lift assist devices.



Image: Courtesy of Mark Hennessy, Australia

Transporting

- Poor carrying technique and containers
- Poor push-pull technique and tools


Lift-assist Devices

- Build-in lift-assist tracks
- Use mobile hoist (loaded for push/pull testing) to assist with patient lifts/transfers.



Images: Courtesy of Mark Hennessy, Australia

Bed Design

- Beds electrically raise from floor to hip level, BUT control often at floor level.
- Bedmaking often involves stooping and awkward postures.


Changing IV bags

- Task performed multiple times a day for every patient
- REBA score = 9.
- High Risk Level : Action needs to be taken SOON
- Use height-adjustable IV stand that can be easily and quickly adjusted.

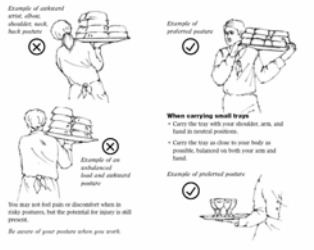



Carrying Technique

- Palm-up grip is poor tray carrying technique

Carrying Technique

- Train good carrying technique
- Use two-handed carrying where possible
- Use a cart where possible.



http://www.worksafebc.com

Carrying Phlebotomy Trays

- On average each phlebotomist carries the tray 10-15 times per day.
- Each phlebotomist carries the tray 2-3 times per day to the living centers and 8-10 times per day to the acute hospital floors.
- Average weight of sample tray: 5.25lbs.
- Handle design issues:
  - Height/clearance: ~2 inches.
  - Length ~ 4.75 inches.
  - Often has hard contours.
  - Centrally positioned is suboptimal.
- Lightweight carts or shoulder strap bags that can prevent dropping and spilling should be used.

Measure Pull/Push forces

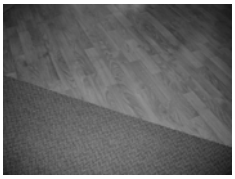
- Measure Pulling/Pushing forces with object loaded
- Use Snook push/pull tables

Image: Courtesy of Mark Hennessy, Australia

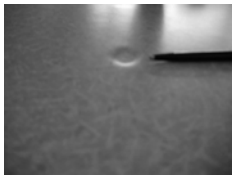
Floor Surfaces

- Floor surface choices affect push/pull forces
- Floor surface choices affect slips/trips

Avoid transitions



Avoid compressible surfaces where heavy loads are moved



Images: Courtesy of Mark Hennessy, Australia

Cart Design

- Push carts frequently used
- Often metal for durability/hygiene (adds weight).
- Heavy carts can cause injuries
- Often only the rear wheels can change direction, making a cart very hard to maneuver.
- Wheel design often inadequate.

Cart Design and Technique

- Avoid food carts that involve low reaching
- Avoid inadequate cart handles e.g. on bed making linens carts
- Avoid push/pull cart "trains"

Computer carts

- Avoid flimsy computer carts.
- Avoid computer carts with poorly designed height adjustment mechanism.

Laboratory Problems: Clutter vs. clearance

- Remove clutter from under desk surfaces to create leg clearance

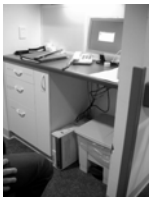


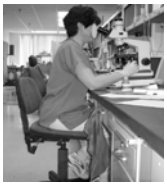
Image: Courtesy of Mark Hennessy, Australia

Laboratory Problems: Poor Surface Heights

- Inadequate thigh/leg clearance
- Arm compression, flexed arms
- Lower back is not supported

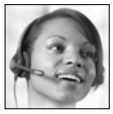
Laboratory Problems: Poor Chair Fit

- Inadequate leg clearance because of low surface height
- Sustained arm/elbow flexion
- No arm rests
- Feet aren't flat on the ground or supported
- Lower back is not supported
- Consider alternative seating



Laboratory Problems: Phone and Keyboard Use

- Poor phone usage posture can lead to neck strain.
- Use phone shoulder rest.
- Use hands-free headset.
- Poor wrist posture on keyboard.



Lab. Pipette Usage

- Use electronic/Automated ergonomic pipettes for highly repetitive tasks.
- Limit continuous pipetting periods to 20 minutes or less.
- Vary activities, or take frequent short breaks.
- Rotate pipetting tasks among several people.
- Work with arms close to the body to reduce shoulder strain.
- Keep head and shoulders in a neutral position
- Don't elevate arm without support for lengthy periods.
- Use adjustable chairs or ergo-task stools with built-in solid foot rest.

Microscopy: Arm Support Pads

- Supports wrists and forearms in a neutral position.
  - Allowing for a more comfortable working position with less fatigue.
- Helps provide support in a more upright position
  - Relieves fatigue and discomfort to neck and back.
- Eliminates resting elbows and forearms on hard work surfaces.

Microscopy: Equipment

- Expanded-pupil technology to enhance the ergonomic performance of the microscope:
  - Freedom to wear glasses
  - Increased eye distance allows for safety spectacles to be worn
- LCD Displays or Video Microscopes
  - Reduces eyestrain by minimizing use of binocular lenses.
  - Reduces awkward neck posture

Histology Equipment

- Strain from swivel motion, turning crank, and lower back pain from leaning over machine
- Decreased range of motion
- Employees received carpal tunnel treatment, treatments of wrist and elbow tendonitis, and cervical neck pain
- RULA score of 6 requires a change in position SOON and further investigation.
- High-speed motorized unit for paraffin-embedded specimens. Motorized cutting mechanism and feed system.

Radiology: Overhead X-ray

- X-ray machine push force ~ 3lbs at a chest level - employees report shoulder injuries
- Moving the machine in any direction required pushing a specific button as well as.
- Bed adjuster positioned too far underneath the bed making it difficult to reach.
- X-ray machine grips typically ~1" diameter which is too small for an optimal power grip (~3").
- The grip and the button location to move the machine are not close enough to allow a full power grip.
- 9.5lb lead vests with shoulder straps are worn by technicians while shooting x-rays.

Radiology: Overhead X-ray

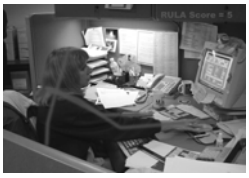
- User characteristics play a significant role in injury risks.
- User technique plays a significant role in injury risks.
- REBA score = 10
- High Risk Level and necessary action is needed SOON.

Radiology: Solutions

- Train technicians on proper overhead x-ray machine use and make them aware that it should be positioned at chest level before pushing or pulling it.
- A machine that has only one (1) button for all movements is best and the button should be located on the grip so force can be used by all fingers, not the thumb.
- Enlarge the grip on the overhead and chest x-ray machine (can be made bigger with foam rubber/tape).
- Extend bed foot pedals and have an additional system to move the bed back and forth instead of pushing it.
- Lighter weight vests with waist bands to take some of the weight off the shoulders should be used.

Patient Accounts

- Poor static postures are commonplace among computer workers in patient accounts.
- Employees need ergonomics education and ergonomic workstations.



Filing

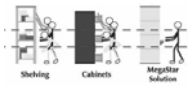
- Poorly design file locations pose postural problems for employees.
- REBA score = 10
- High Risk Level : Action needs to be taken SOON

Radiology – Filing System

- Filing Area – used 8 hours a day.
- Constant reaching and bending.
- Frequently Reported Filing Injuries:
  - Pulling X-Ray file folders from file racks
    - Right shoulder strain
    - Employee hit in face by falling folders
  - Lifting 6-8 file folders each time
    - Lower back strain (Lost Time -55 Days>$10,872)
  - Foot stool available is trip hazard
    - Employee fell - contusion to knees
- REBA score = 9
- High Risk Level : Action needs to be taken SOON

Filing Equipment

- Vertically arranged rotating shelves controlled by an electronic keypad or software.
- Stores the equivalent of ~27 vertical file cabinets in a fraction of the space
- Improve records manage and productivity up to 56%.
- Minimizes physical effort such as twisting, bending and tight grasping
- Provides easy system operation regardless of the user's body size, posture or mobility.
- Can be operated in seated position.



Cleaning & Maintenance

- Bending, twisting, shoulder abduction and wrist deviation occurring in many routine cleaning tasks.
- Change or modify equipment and automate where possible
- Teach proper cleaning techniques

Food Preparation

- Repetitive tasks performed by chef's dominant arm

Food Preparation

- Many examples of awkward postures when reaching beyond ideal working range

Food Cold Storage

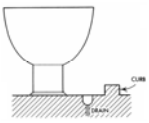
- Crowded storage areas lead to reaching over piled goods and improper lifting technique.

Tray Loading and Unloading

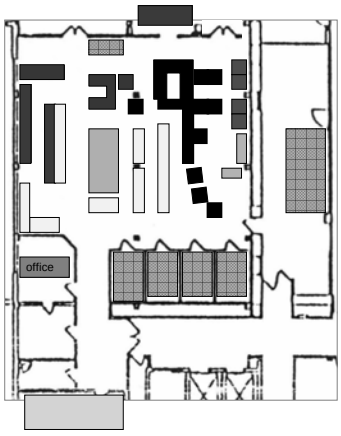
- Bending to retrieve low objects in cramped spaces with poorly design equipment

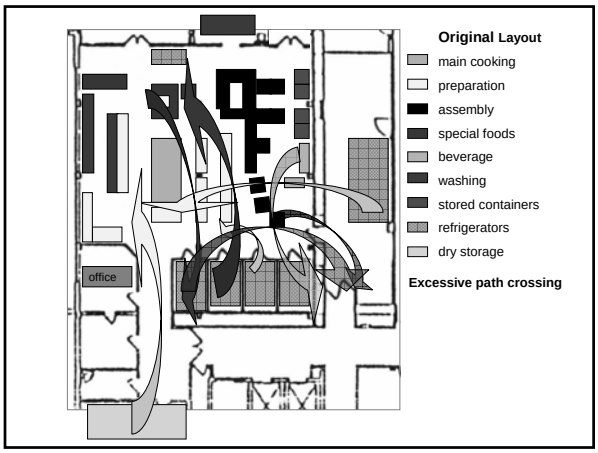
Kitchen Slip and Trip Hazards

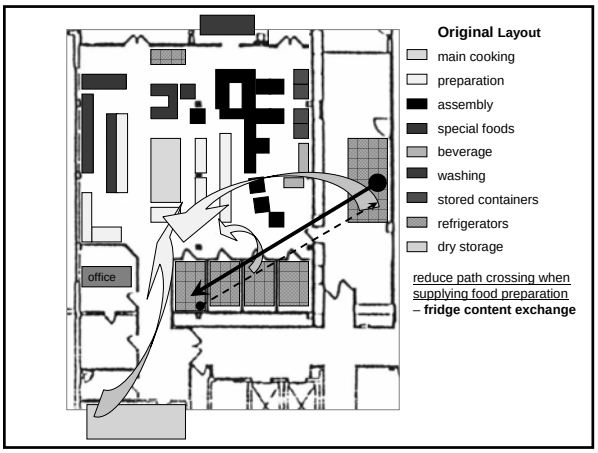
- Lack of drainage results in wet floors which pose slip hazards



- Inappropriate mat placement creates a trip hazard




Original Layout
main cooking
preparation
assembly
special foods
beverage
washing
stored containers
refrigerators
dry storage
Excessive path crossing
office


Original Layout
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reduce path crossing when supplying food preparation – fridge content exchange
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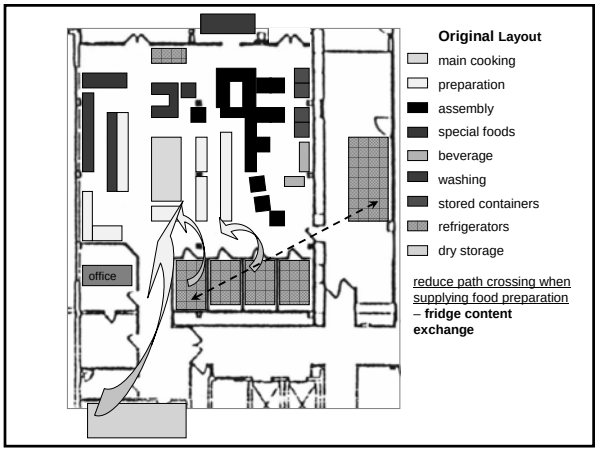
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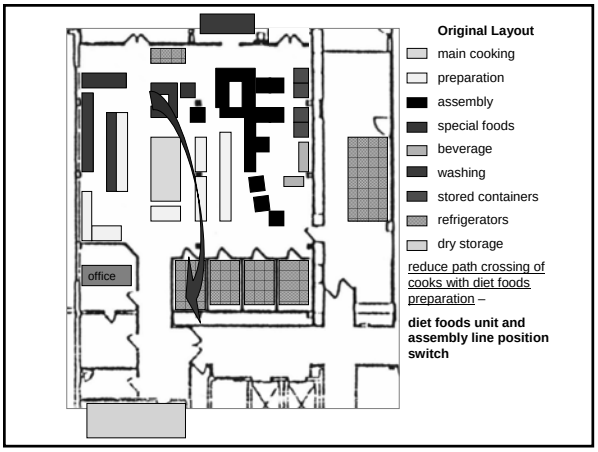
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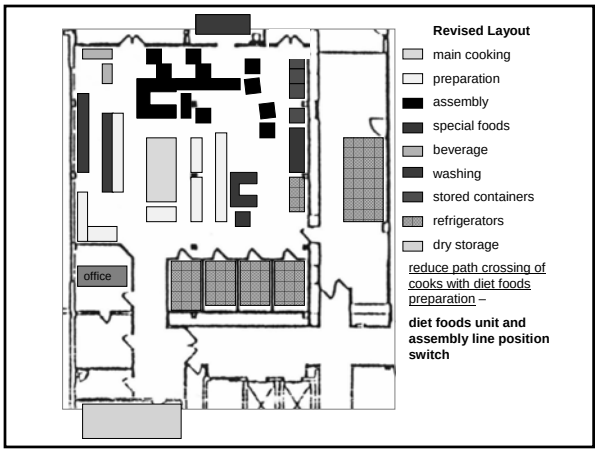
reduce path crossing of cooks with diet foods preparation –
diet foods unit and assembly line position switch
office


Revised Layout
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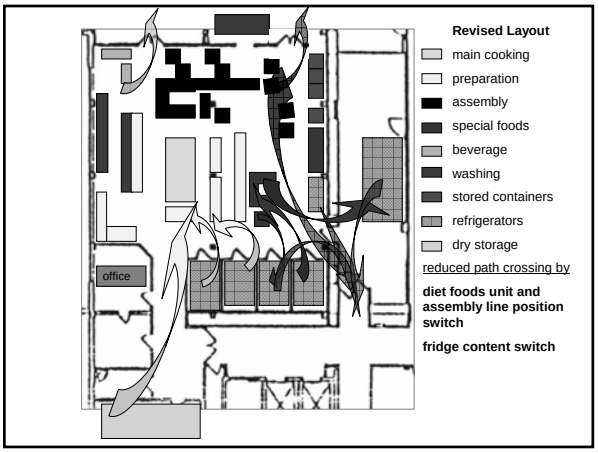
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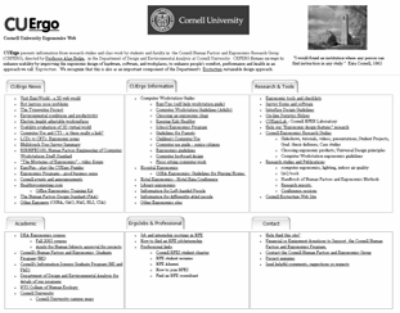
diet foods unit and assembly line position switch
fridge content switch
office

Conclusions

- Hospitals offer a multitude of opportunities for ergonomists to improve the comfort and health of their employees. Only a few of which have been considered here.
- With increasing pressures on healthcare, effective hospital ergonomics will become increasingly important.
- To be most effective, ergonomists must be involved in the design of facilities, jobs and work processes, in the selection of work equipment and in personnel training.
- Each hospital needs a comprehensive sitewide ergonomics plan and allocate the necessary resources to support this.

Cornell University Ergonomics Web

http://ergo.human.cornell.edu



Questions and Comments