

Ergonomic Principles in the Design of Healthcare Environments

Isn't it ironic that the same facilities where ill or injured people seek care can also be dangerous to work in?

The healthcare environment can be a very stressful environment, both physically and mentally, with tight deadlines and patients' well being at risk. It is potentially hazardous, due to possible exposure to contagious diseases and toxic chemicals. It is also a highly regulated environment where compliance failures can cost the organization money and put the jobs of staff in jeopardy.

The healthcare environment is a high-tech environment, with frequent changes in technology. And it is often a three-shift, multi-user environment in which three different people may utilize the same workstation and chair doing the same job on different shifts.

Major changes have occurred in healthcare that have affected the working conditions of employees as well as raising the potential for injuries.

Staff reductions, the transition from inpatient to outpatient care, and the increasing age of healthcare employees have contributed to the mental and physical load on personnel, often leading to stress and injuries. According to the CDC (Centers for Disease Control and Prevention), rates of occupational injury in the healthcare field have risen over the past 10 years.

Although the healthcare workers that are most likely to develop injuries are those with jobs that require them to lift or move patients, there are many other tasks in healthcare that can cause or contribute to injuries.

Exposure to environmental and work-related stressors in healthcare workplaces can result in a variety of disorders referred to as musculoskeletal disorders (MSDs).

The Occupational Health and Safety Administration (OSHA) defines MSDs as "injuries and disorders of the muscles, nerves, tendons, ligaments, joints, cartilages, and spinal discs."

MSDs generally develop gradually over time. They can affect different areas of the body including upper limbs, head and neck, and upper and lower back.

The work environment, technology, and individual physiology are risk factors that may contribute to MSDs. Other risk factors include repetitive motions, holding one position for long periods, awkward postures, local pressure on muscles, tendons, and nerves, and the use of force.

It is usually a combination of several of these factors that increase the likelihood of developing an MSD.

According to OSHA, the average cost per incidence of an MSD is estimated to be \$12,000, which includes lost work with full wages, replacement wages, lost productivity, and medical treatment (not including surgery). If surgery is required, the average cost bumps up to \$43,000 per incidence according to the American Society of Orthopedic Surgeons.

But beyond that, the cost in suffering and diminished quality of life for the workers cannot be calculated.

When healthcare workers give of themselves to care for others, don't they deserve safeguards against suffering bodily injury?

Many studies demonstrate that ergonomics programs can protect workers from injury, increase their productivity, decrease turnover, and save the healthcare organization money in lowered workers' compensation costs and reduced workdays lost.

Ergonomic Principles in the Design of Healthcare Environments cont'd

The Science of Ergonomics

Ergonomics is the science of fitting the physical environment and the job to the worker's capabilities or limitations as well as to the tasks performed. Ergonomics programs can often prevent work-related MSDs that occur when there is a mismatch between the environment, the worker, and the task.

In developing ergonomics programs, ergonomists employ anthropometrics (the size, shape, and weight of people), biomechanics (the physical dynamics and limitations of people), situational analysis (the social and physical task environment), and preventive medicine.

People come in all shapes and sizes

People vary widely in all their dimensions and differ considerably in shape and overall size.

In addition to the 17 inches in height and 140 pounds that separate a 1st-percentile female from a 99th-percentile male, there are gender-related differences in bone structure and weight distribution and infinite variations in limb lengths and body contours.

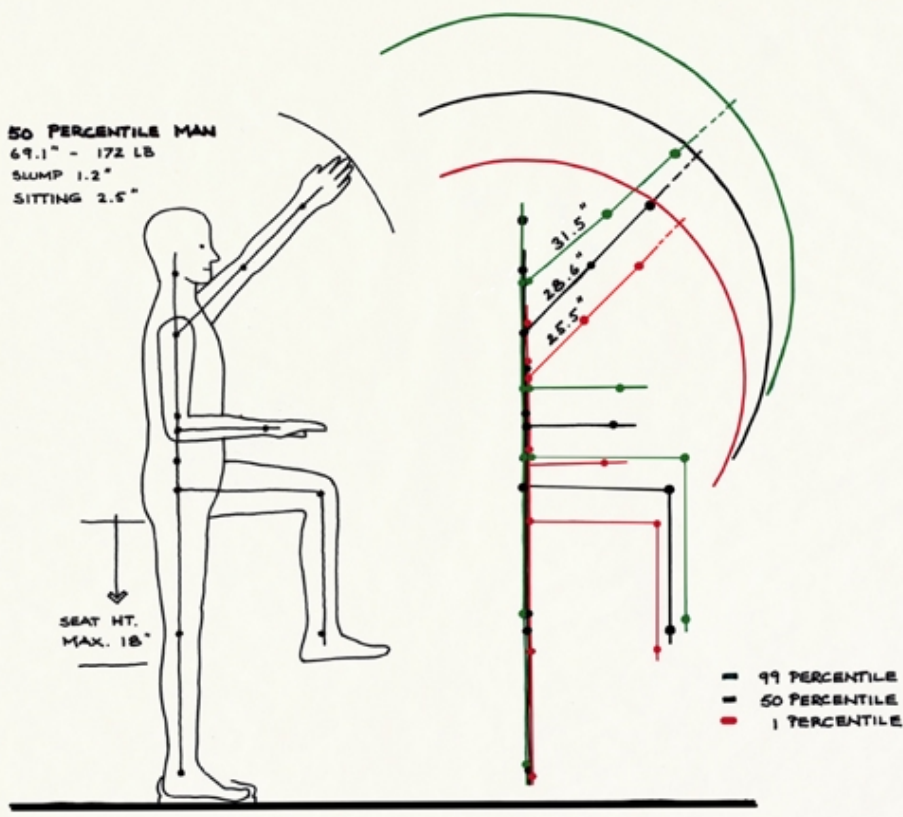
Even among a group of people of the same gender, age, and stature, there can be significant variation in bodily proportions.

Today's workforce is more varied in its demographics than ever before. There are more women, Asians, and Hispanics, many of whom are smaller in stature than their North American or European (especially male) counterparts, who seem to get taller with each generation. There are also more people at middle and older ages, and more people with disabilities.

An understanding of body size, weight, and gender characteristics is important in order to properly fit workers to the work environment and their tasks.

The science of anthropometry studies these human body dimensions. It uses joints and creases on the body as landmarks for measurements.

Anthropometric surveys present a picture of population demographics including age, gender, ethnic characteristics, and sizes of people – from the 1st to the 99th percentile to give us a better picture of the smaller and larger segments of workers.



The science of anthropometry studies human body dimensions and is used to determine the best fit between body dimensions and the tasks performed by workers.

Ergonomic Principles in the Design of Healthcare Environments cont'd

One size does not fit all

People who make decisions about the work environment must understand a great deal more than where to place workstations or equipment. They must consider the changing size – both numerically and physically – of people in the workforce, their tasks and work spaces, their safety and health, and their comfort.

Given a workforce that has more physical dissimilarities and a greater range of body types than ever before, progressive organizations no longer expect their employees to fit the work environment. As they have learned from complying with the Americans with Disabilities Act (ADA), there are overall benefits to be gained from making the environment fit the employee.

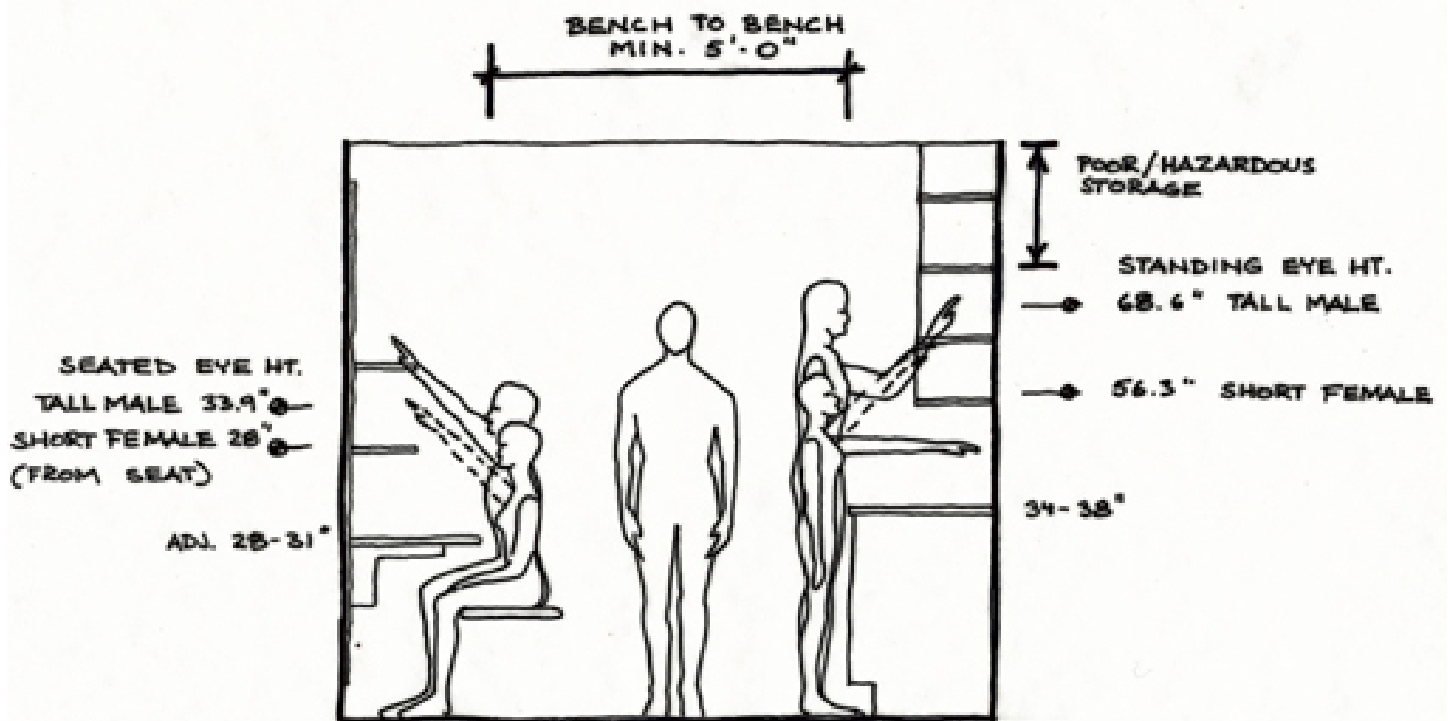
Planners should not design for the “average” person because there is no such thing as an “average” person. People are different. A person of average height may not be the average weight; a person of average weight may not have average reach, and a person with average reach may not have average proportions.

Planners should design for a broad range of characteristics to maximize the portion of the population that can most comfortably function in the spaces to be developed.

Diversified workers require versatile environments to support them. A work area that is modular and flexible allows users to change their environments to meet changing needs.

Consideration also must be given to the location of equipment and machinery. Staff must be able to reach equipment and machinery comfortably to use it properly and safely.

Group anthropometric characteristics are considered when multi-occupancy workstations and seating must be shared due to multi-shift use. These workstations should be designed to support a full range of size adjustments to accommodate anyone from the largest male to the smallest female.



In planning workstations, designers need to consider the range of body dimensions of the people who will use the workstations.

Ergonomic Principles in the Design of Healthcare Environments cont'd

Ergonomics in Healthcare Environments

Ergonomic design considerations begin with human abilities and limitations and how they affect the work process. Assessment of work tasks involves an examination of the duration, frequency, and magnitude of exposure to ergonomic stressors such as force, repetition, awkward postures, vibration, and contact stress to determine if employees are at risk of pain or injury.

Specific work environments in healthcare facilities may have additional special technical and human interface requirements.

Pharmacies

As technology and processes change frequently in pharmacies, workstations must adapt readily to allow staff to work efficiently and safely.

Pharmacies require storage systems with everything within easy reach. For example, retrieval of frequently used medications can be accomplished with an efficient, timesaving unit dose picking station.



Having items within arm's length results in little wasted time and motion or in overreaching practices that can result in injuries. As supplies or procedures change, a flexible station can be reconfigured to accommodate the new work tasks.

As pharmacies become more involved in the treatment and education of patients, the relative proportions of office, reference, storage, and drug distribution spaces constantly shift. Fixed workstations at counter-height can be replaced with adjustable workstations that will accommodate these changes without contributing to stress and strain on staff members.

Laboratories

The planning of laboratories should be sensitive to the comfort and safety of the staff by providing an atmosphere that helps to minimize this stressful work environment.

In U.S. hospital laboratories today, approximately 70 percent of the workers are women, who are typically not as tall as their male counterparts and might not be able to reach up to a shelf that would be an easy reach for someone who is taller.

Lab processes and equipment change rapidly. Equipment sizes vary widely and need to be placed at different heights for maximum accessibility.



Some tabletop equipment is too tall to be used comfortably on standard-height work surfaces. Staff may resort to using a stool or platform when the equipment is placed on stand-up, fixed casework creating an unsafe work environment.



Workstations that can be adjusted are especially critical in the task-intensive lab in which there are often three shifts of various sized staff working in the same environment.

Ergonomic Principles in the Design of Healthcare Environments cont'd

Nurses Stations

Healthcare delivery continues to be a high-risk business, with extensive regulations and policies, and continues to produce constant changes in medical procedures and nursing functions. The increasingly aging population means an increase in the level of acuity of inpatients. Treatment of these patients requires increased supplies, medications, and additional nursing and support staff in patient units.



Staff will assume almost any posture, no matter how awkward or uncomfortable, to accomplish tasks.



Varying the heights of work surfaces allows staff to complete work quickly and safely without awkward postures.

Rapidly changing technology, new instrumentation, more sophisticated methods of treatment, and changing staff necessitate re-evaluation of the use of space, movement of supplies and inventories, and the ability to make rapid changes with minimal downtime.



Use of vertical space and cantilevered, adjustable surfaces keeps monitors, printers, and fax machines at appropriate heights as well as freeing up valuable work space in nurses stations.



The emphasis on "patient-focused" care means creating new spaces for social, educational, and functional activities and providing an atmosphere of comfort, dignity, and control for the individual patient and the family.

Ergonomic Principles in the Design of Healthcare Environments cont'd

Materials Management

The location of storage areas and the way that materials are transported from the loading dock to storage and then to the point of use should be planned carefully to maximize efficiency, minimize double-handling, and reduce risk of injury to staff.



Carts and transport equipment should be easy to push or pull, have casters that roll easily over uneven floors and thresholds, and have no sharp edges that can injure users.

In storage areas, staff must be able to reach equipment and supplies stored and to be able to move around comfortably. They should be able to restock storage areas with a minimum of time and effort.



Height-adjustable work tables with casters allow staff to adjust the work process to their comfort level to reduce the risk of awkward postures in the repetitive tasks performed in central supply departments.

Administrative Areas

Workflow patterns should be planned to reduce wasted motion, and thus increase efficiency. Within individual spaces, sufficient space must be allowed for the movement of people and equipment.

Private/staff areas include offices, consultation rooms, staff lounges, and locker rooms. These areas need to be planned to facilitate the activities that are to take place within them, not carved out of leftover space. The design should follow the flow of people, information, and materials and should promote interaction. These spaces should be inviting and large enough for comfort.

Offices should be well equipped with adjustable workstations and chairs, and work tools such as keyboard trays, tackboards, message holders, and paper trays that promote safe and healthy work habits.

Workstations with work surfaces whose heights are adjustable accommodate computer equipment more easily because the work surfaces can be lowered, allowing a level work plane from the equipment to the adjacent work surfaces.

Seating should be task-supportive and be easy to get into and out of. It should be fully and easily adjustable, especially since it will often have three different users during a 24-hour period. As appropriate, casters are needed to facilitate movement of the chairs.



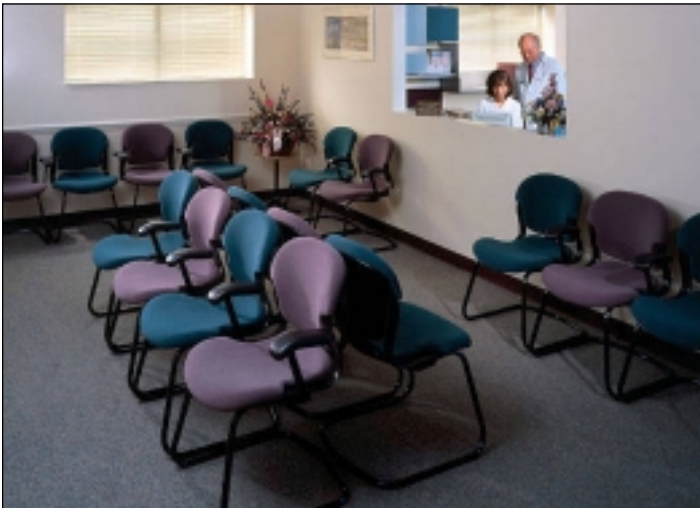
Good workstation design and adjustable, ergonomic seating are key to creating healthy, comfortable, and task-efficient work areas.

Ergonomic Principles in the Design of Healthcare Environments cont'd

Public Spaces

Public spaces consist primarily of waiting rooms, lounges, and corridors and are often the scenes of stressful waiting. Waiting room seating should provide proper physical support and have armrests to define personal space, provide a bit of privacy, and allow users to sit down and stand up easily.

Chair arrangement should be offset sufficiently to give adequate clearance for wheelchairs and walkers. Distance between facing chairs should be at least eight feet in the United States, and as appropriate in other countries, according to norms and customs regarding personal space.



Healthcare waiting rooms are often stressful environments. Comfortable and supportive seating can make this environment more user-friendly for both patients and visitors.

The size of corridors is generally defined by building codes. Handrails in corridors are recommended; they provide assistance to those having difficulty walking and can also, depending on their design, serve as bumper guards for stretchers.

Lighting should be appropriate to the function of the space. Corridors should be well lit. In public areas, lighting should be ambient, incorporating natural light when possible. Corridors in patient areas should have adequate but reduced lighting at night to permit patients in rooms to rest. The Illuminating Engineering Society publishes lighting guidelines.

Other Ergonomic Considerations

In the healing environments of healthcare, it is particularly important to take care of those who care for the ill and injured. One of the ways to care for caregivers is to provide them with a healthy and safe workplace.

In addition to protecting their workers, healthcare organizations can reap financial benefits by incorporating ergonomic principles in the planning of healthcare environments, whether during new construction or in existing facilities undergoing renovation.

Worker absenteeism due to injuries, as well as workers' compensation costs, should decline with improved ergonomic conditions in the workplace. And ergonomics should enable employees who may have work restrictions, such as older, disabled, or pregnant workers, to perform their duties and remain on the job for longer periods of time.

In addition, consideration of ergonomic factors in healthcare facilities can make healthcare environments more user-friendly for patients and visitors as well.

Ergonomic Principles in the Design of Healthcare Environments

By Jack M. Eichner, MFA, IDSA
Herman Miller for Healthcare