AnsellCARES™

InTouch™
CLINICAL UPDATE

HEALTHCARE ERGONOMICS

Part two of a two part self-study monograph for continuing education for healthcare workers with an interest in occupational and patient safety and infection prevention.

ISSUE 5 Part 2

INSIDE THIS ISSUE

LEARNING OBJECTIVES

After completing this continuing education activity, you should be able to:

1. Discuss the ergonomic challenges related to, the unique characteristics of operating room design, workflow, equipment, and staffing.
2. Identify Risk Factors Associated with Hand Injury.

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The opinions expressed in this edition are the authors' only and may not represent the official position of Ansell or Bond University.

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GUEST FACULTY

In this edition we welcome contributions from Rose Moss, MN, RN, CNOR, Perioperative Nurse Consultant/Medical Writer, Moss Enterprises, LLC. Rose has prepared a comprehensive review of “Ergonomic-related Injuries in the Operating Room (OR) “ which is reproduced in full.

As well, Don Cronk, Regulatory Affairs and Technical Services Manager at Ansell shares his views on the importance of ergonomic glove design.

Together, the contributions from these two experts provide readers with valuable insights and data which can be readily applied to individual healthcare settings and organizations to improve working conditions.

EDITORIAL

In the first of our special two-part edition of AnsellCares™ InTouch™ readers were introduced to basic principles of ergonomics and provided with compelling data illustrating the extent to which poor ergonomic design can negatively impact healthcare quality and efficacy. As promised in part one, this final part of the two-part edition specifically examines the unique ergonomic needs and challenges posed by operating room design, activity and staff. Operating rooms by their very nature are complex. They routinely oscillate from being places of exemplary control and order to places of extreme chaos and stress. The often unpredictable nature of work in the operating room requires flexible design. So too do the ever changing requirements for storage, movement and safe operation of operating room equipment.

In addition to these overarching large scale ergonomic challenges smaller challenges like consistently providing workers with equipment and supplies which are functional, high performance and comfortable remain. In this issue we also review how ergonomic principles influence and are incorporated in glove design. Together these articles give a brief but interesting overview of how important ergonomics are in healthcare. They also highlight how better understanding of these issues can lead to important workplace modification and elimination or ergonomic risk, an important but sometimes overlooked part of healthcare worker safety.

ERGONOMIC-RELATED INJURIES IN THE OPERATING ROOM (OR)

ROSE MOSS, MN, RN, CNOR

The dynamic nature of the hospital environment, combined with serious hazards, such as lifting and moving heavy patients and equipment and slips, trips, and falls, make it a dangerous workplace setting.[1] The OR presents additional, unique challenges in regards to ergonomic-related injuries; the occupational hazards inherent to the perioperative practice setting include, moving and lifting patients and heavy instruments and equipment, overexertion, lifting and holding patient extremities, and static and/or awkward postures (eg, standing and/or holding retractors for extended time periods).[2]

Because ergonomic-related injuries adversely affect health care workers (HCWs) and safe patient care, perioperative nurses and other personnel involved in surgical patient care must remain aware of the clinical and economic implications of ergonomic-related injuries, as well as best practices and solutions available today to make the OR a safer environment of care.

CAUSES OF ERGONOMIC-RELATED INJURIES IN THE OR

The two leading causes of work related ergonomic injuries among hospital workers include overexertion and bodily reaction often related to patient handling (48%), including motions such as lifting, bending, or reaching, and slips, trips, and falls (25%).[3] Fatigue is another cause of ergonomic-related injuries and staff accidents in the OR.[4]

In the surgical practice setting, fatigue is primarily related to the work schedule and sleep, but the degree to which comfort has been incorporated into the design of the OR features and equipment may also be a factor.

INCIDENCE OF ERGONOMIC-RELATED INJURIES

United States

In 2011, hospitals in the United States reported 253,700 work-related injuries and illnesses; this is a rate of 6.8 work-related injuries and illnesses for every 100 full-time employees, which is almost double the rate for private industry as a whole.[5]

Compared to other occupations, nursing personnel are among those at highest risk for musculoskeletal disorders (MSDs); on the United States Bureau of Labor Statistics (BLS) list of occupations at-risk for sprains and strains, nursing personnel, nurse aides, orderlies and attendants are listed as first and registered nurses (RNs) are sixth, compared to truck drivers (second); laborers (third); stock handlers and baggers (seventh); and construction workers (eighth).[6]

Data from the United States BLS for 2009 show that the incidence rate of lost-workday injuries from slips, trips, and falls on the same level in hospitals was 38.2 per 10,000 employees; this was 90% greater than the average rate for all other private industries combined (20.1 per 10,000 employees).[7]

In addition, strains and sprains represent 54% of injuries that result in days away from work; strains also account for the largest share of workers' compensation claim costs for hospitals.[8] In 2011, hospitals in the United States reported 16,680 cases in which workers missed work because of a musculoskeletal injury related to patient interactions; nurses and nursing assistants both accounted for a substantial share of this total. Since the majority of musculoskeletal injuries in the hospital setting are cumulative, any steps taken to minimize risks during patient handling activities will provide significant benefits for hospital workers.

Europe

Within the workplace across Member States, the true extent of MSDs and their related costs are difficult to assess and compare, due to the various organizations of insurance systems, the lack of standardized assessment criteria, and questions about the validity of the reported data.[9]

Asia/Pacific

In the Asia/Pacific region, there is no standard method of tracking occupational ergonomic-related injuries.

In Australia, 19,248 successful workers' compensation claims for serious injuries or illness were made by the health care and community services sector between 2011 and 2012; of these claims, over half (52%) were muscular stress related to manual moving or repetitive movement; 18% were for slips, trips, and falls.[10]

In Singapore, data from the Ministry of Manpower for 2010 to 2011 reported a 295 temporary disablement rate

ERGONOMIC-RELATED INJURIES IN THE OPERATING ROOM (OR)

per 100,000 persons employed in the health care sector; this report identified slips, trips, and falls as one of the top three incident types that accounted for over half (56%) of temporary disablements in 2011.[11]

A study in the International Journal of Occupational Safety and Ergonomics noted that Korean (93.6%), Australian (92.6%), and Japanese (78.4%) nurses incur a very high MSD burden when compared internationally.[12]

ASSOCIATED COSTS OF ERGONOMIC INJURIES

In the United States, occupational ergonomic injuries are costly to hospitals both directly and indirectly,[13] as described below.

- $15,860 USD: this was the average reported workers' compensation claim for a hospital injury between 2006 and 2011.[14] Another source cites an average cost of $22,300 USD for claims involving lost time, in comparison to $900 for claims not involving lost time.[15] The average hospital in the United States incurs $0.78 USD in workers' compensation losses for every $100 USD of payroll; nationwide, the annual expense totals $2 billion USD.[16]
- 24% of nurses and nursing assistants changed their shifts or took sick days to recover from an unreported injury.[17]
- $27,000 to $103,000 USD are the estimated costs associated with replacing a nurse; these costs include separation, recruiting, hiring, orientation, and training.[18] Some estimates also include lost productivity while a replacement nurse is hired and trained.
- 8 out of 10 nurses (80%) report that they frequently work with musculoskeletal pain.[19]
- Safer caregivers result in happier patients. Studies have demonstrated higher patient satisfaction levels in hospitals where fewer nurses are dissatisfied or burned out.[20]

Work-related slips, trips, and falls are also associated with serious, disabling injuries that can impact a HCW's ability to do his/her job; these incidents often result in costs associated with:

- lost workdays;
- decreased productivity; and
- expensive worker compensation claims.[21]

In Europe, some studies have estimated the cost of work-related upper extremity MSDs at between 0.5% and 2% of the Gross National Product.[22] More recent data from Austria, Germany, or France have demonstrated an increasing impact of MSDs on costs. For example, in France, 2007 data show that work-related MSDs resulted in nearly 7.5 million lost work days, with approximate costs of €736 million.[23]

In Australia, for financial year 2008-2009, the total economic cost of work-related injuries and illnesses was estimated to be A$60.6 billion dollars, representing 4.8% of the Gross Domestic Product.[24]

BEST PRACTICES FOR PREVENTING ERGONOMIC-RELATED INJURIES IN THE OR

Today, there are regulations as well as best practices outlined by professional nursing associations to prevent ergonomic-related injuries in the OR, as described below.

STATE NO LIFT LAWS

In the United States, the following 11 states have enacted "safe patient handling" laws or published rules and regulations: California, Illinois, Maryland, Minnesota, Missouri, New Jersey, New York, Ohio, Rhode Island, Texas, and Washington; there is a resolution from Hawaii. Of these states, ten (California, Illinois, Maryland, Minnesota, Missouri, New Jersey, New York, Rhode Island, Texas, and Washington) require a comprehensive program in health care facilities, consisting of an established policy and guidelines for obtaining appropriate equipment and training, data collection, and evaluation.[25]

AMERICAN NURSES ASSOCIATION

The ANA supports policies and actions resulting in the elimination of manual patient handling, in order to provide a safe environment of care for both nurses as well as patients.[26] The ANA recognizes that MSDs are common in nurses, frequently caused by manually moving of patients; and can be life altering and sometimes, career-ending events. The ANA's Handle with Care® Campaign is designed to develop and implement a proactive, multi-faceted plan to support the issue of safe patient handling and the prevention of MSDs among nurses in the United States.[27]

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ERGONOMIC-RELATED INJURIES IN THE OPERATING ROOM (OR)

One component of this campaign relates to the effectiveness of safe patient handling equipment and devices, which has eliminated manual patient handling in nursing care. Moreover, many of the health care facilities that have incorporated patient handling technology have reported reductions in both nursing staff injuries, number of lost work days secondary to injury and staff turnover, and workers' compensation costs for MSDs.

ASSOCIATION OF PERIOPERATIVE REGISTERED NURSES (AORN)

AORN publishes and regularly updates three documents related to preventing work-related injuries.

- Guidance Statement: Safe Patient Handling and Movement in the Perioperative Setting.[28]
  This document identifies seven critical activities and corresponding recommended ergonomic tools developed for safe patient handing and movement to eliminate work-related MSDs; they include the use of various types of assistive technologies and mechanical devices. This statement also notes that manufacturers are encouraged to continue to develop new and innovative technologies for the safety of both HCWs and patients.
- Guideline for a Safe Environment of Care, Part I.[29]
  Recommendation I states:
  "Precautions should be taken to mitigate the risk of occupational injuries that may result in death, days lost from work, work restrictions, medical treatment beyond first aid, and loss of consciousness."

The recommendations for an ergonomically healthy perioperative environment include the following.

- Educate staff members on the use of patient handling devices and strategies to prevent musculoskeletal injuries.

Cord Cover

Patient Transfer

- Provide appropriate assistive patient handling equipment.
- Cover equipment cables across the floor.
- Use anti-fatigue mats.
- Use lift teams as well as assistive devices to lift or transfer patients.

In addition, AORN includes a discussion on ergonomic hazards specific to minimally invasive surgery in the Guideline for Minimally Invasive Surgery including recommended provisions for slips, trips, and falls, adequate lighting, and location of equipment that prevents fatigue from glare or static positions.[30]

PROVEN EFFECTIVE TECHNIQUES TO REDUCE ERGONOMIC-RELATED INJURIES INCLUDE THE FOLLOWING.[31,32,33]

- Select appropriate mechanical patient-handling equipment and devices.
- Provide sufficient training on proper operation of lifting equipment.
- Complete patient mobility assessment with accurate alignment to equipment and protocols.
- Develop safe-lifting policies and procedures.
- Initiate specialized patient lift teams when available.

ERGONOMIC-RELATED INJURIES IN THE OPERATING ROOM (OR)

Today, various solutions that reduce injuries and increase HCW and patient safety are available. Equipment and devices specifically designed to prevent ergonomic-related injuries in the OR include the following.

- Patient transfer sheets. Friction-reducing, patient transfer and repositioning sheets are designed to prevent disabling back injuries to HCWs by reducing physical strain to the back, shoulders, neck and arms.
- Anti-fatigue mats. Anti-fatigue mats are designed to decrease stress and strain placed on muscles and joints due to static positions (eg, standing during lengthy procedures).
- Ergonomic step stools. Step stools designed with a cushioned top can provide comfort and support during prolonged standing.
- Trip management system. This system consists of a cord cover designed to reduce trips and falls caused by cords and tubings on the OR floor. Brightly colored cord covers are preferable so they are easily seen; they also serve as signals to alert healthcare personnel about the location of cords and tubings on the floor. Adhesive strips are typically included to keep cords in place during use.
- Fluid management systems using absorbent floor pads. To prevent slips and falls in the OR, one of the best measures is to control fluids at their source (ie, so that they never reach the floor).[34] Proactive measures that can be taken to prevent OR floors from becoming wet include the use of the following.
- Absorbent pads on the floor around the OR table. These pads reduce the risk of slips and falls by keeping the floor dry. The absorbent materials in these pads generally absorb fluid without expanding, similar to diapers, so they maintain a low profile and do not become tripping hazards. A fluid-proof, non-slip backing keeps the floor underneath each pad dry.
- Fluid waste management systems.[35] Intraoperative floor suction devices are generally used in high-fluid-volume cases (eg, arthroscopies). Fluid collection systems are drapes that incorporate fluid collection bags.

Ergonomic Step Stools

Absorbent Pad

SUPPORTING WORKER PERFORMANCE & PRODUCTIVITY WITH ERGONOMIC GLOVE DESIGN – DON CRONK

In every industry, from life sciences to manufacturing, workers rely on their hands. And when performing a variety of different tasks, individuals must wear gloves to protect either themselves or the products they work with. The glove a worker wears is important, and can support his or her comfort, performance and productivity by providing the dexterity, grip, tactility and muscle control vital to getting the job done right.

Not all gloves are created equally though, and selecting the glove best suited for the environment as well as the specific application can have a measurable impact on worker health and productivity. This article looks at key considerations for selecting single-use gloves that minimize muscle effort and reduce the risk of ergonomic injury, thereby bolstering worker safety and improving the employer's bottom line.

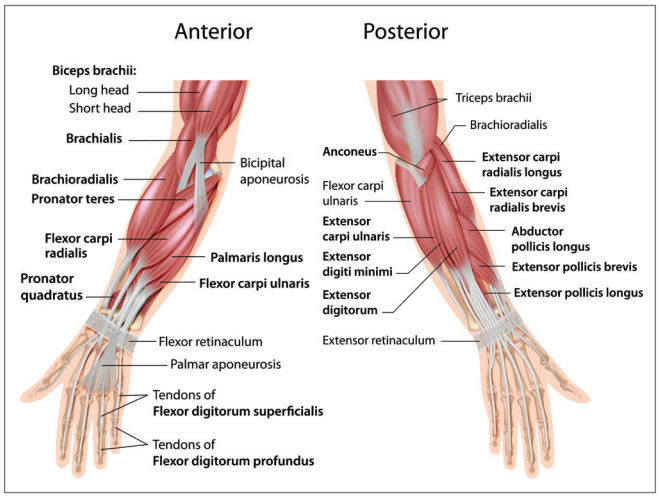
ANATOMY OF THE HAND

The human hand is a complex and delicate structure. Comprised of approximately 24 small bones called carpals, metacarpals and phalanges, it also consists of more than 120 ligaments, 48 nerves and 30 arteries.[1] The two bones of the lower arm, the radius and the ulna, meet at the hand to form the wrist, and the median and ulnar nerves run the length of the arm to transmit electrical impulses to and from the brain to create movement and sensation.[2] It is estimated that roughly 25 percent of the motor cortex in the human brain (the part that controls all movement in the body) is devoted to the muscles of the hands.[3] Because the musculoskeletal systems in the hand, wrist and forearm work together as an intricate unit, the dysfunction of a single part often requires consideration of the whole.[4]

THE ROLE OF ERGONOMICS IN HAND PROTECTION

Ergonomics refers to the interaction between a human's musculoskeletal system and his or her workspace. Various job functions expose workers to risk factors for musculoskeletal disorders (MSDs), such as those conducted at awkward angles or overhead, involving pushing and pulling heavy objects or performed repetitively. With increased knowledge of ergonomic best practices, personal protective equipment manufacturers are able to develop products that protect workers from the risk of MSDs and injury.

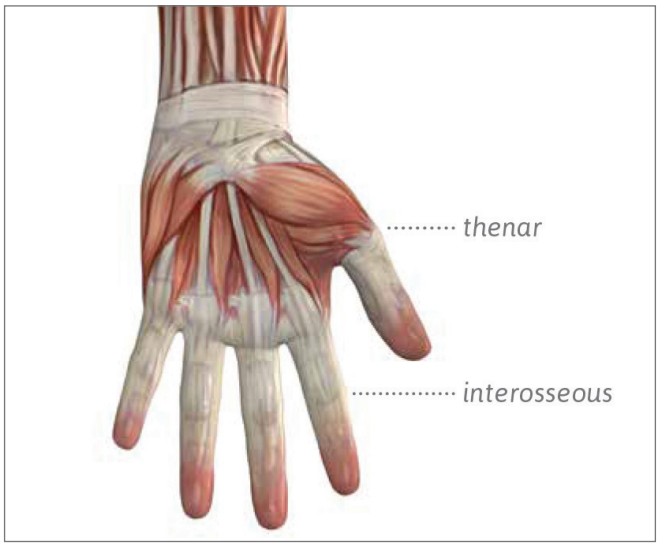
When considering the role of ergonomics in hand and glove use, four main muscle groups are involved. The two primary muscle groups required for hand and finger exertions include the powerful forearm flexor muscles, located at the top of the forearm, and the extensor muscles[5], located in the back of the forearm.



Muscles of the Forearm (right arm)

More than 14 extrinsic flexor and extensor muscles span the length of the forearm, originating at the elbow and inserting at the hand.[6] Together, these large-muscle groups deliver grip strength and general range of motion – essentially all gross motor skills conducted with the hands. Examples of forearm flexor and extensor muscle use in the workplace include lifting or moving heavy objects, manipulating large equipment or climbing ladders.

The smaller-sized primary hand muscles, the interosseous and thenar muscles, originate and insert within the structure of the hand.[7]

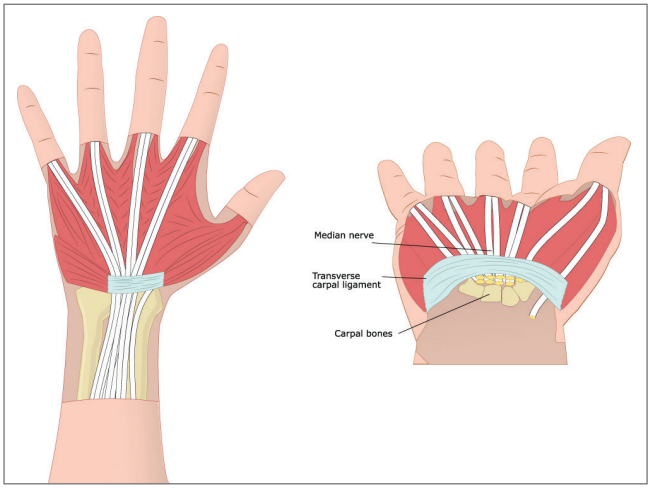


Muscles of the Hand

SUPPORTING WORKER PERFORMANCE & PRODUCTIVITY WITH ERGONOMIC GLOVE DESIGN

The interosseous muscles lie between the metacarpal bones in the hand and are important in moving individual fingers, while the thenar muscles are located at the base of the thumb, in the fleshy muscular area on the palm side of the hand. Together, these muscle groups are responsible for enabling pinching and gripping tasks conducted by any of the fingers and/ or thumb. Most susceptible to fatigue, these small muscles are employed in a multitude of tasks requiring fine motor skills and dexterity across a wide variety of applications, such as the manipulation of small vials, test tubes and instruments such as pipettes in laboratory settings; manipulation of handpieces conducted in dentistry; handling small hardware, wires and wiring harnesses in automotive applications; and even daily writing and typing tasks performed across industries.

Also important in the hand's anatomy as it relates to ergonomics is the carpal tunnel, a narrow passageway of ligament and bones at the base of the hand.[8] The median nerve and tendons housed there are involved in nearly every aspect of hand movement, and are therefore especially prone to strain and injury.



Carpel Tunnel

THE EFFECTS OF HAND FATIGUE

When workers carry out demanding, tedious or repetitive job functions, the muscles, nerves and tendons in their hands, wrists and arms are susceptible to strain. Such strain can result from either bare-handed or gloved operations, but can be exacerbated by glove use when the gloves are thick, rigid, slippery, ill-fitting or otherwise uncomfortable. In fact, when a person wears a glove that restricts movement, he or she must exert more muscle effort to perform tasks, thus increasing the risk of strain. Over time, strain caused by repetitive motion or prolonged exertion can lead to muscle fatigue, pain and even injury. Occupational musculoskeletal disorders (MSDs), such as Carpal Tunnel Syndrome and tendinitis, are a leading cause of lost workday injury and illness.[9] In fact, MSD cases accounted for 33 percent of all worker injury and illness cases in 2013, according to the U.S. Bureau of Labor Statistics.[10]

Occupational musculoskeletal disorders (MSDs), such as Carpal Tunnel Syndrome and tendinitis, are a leading cause of lost workday injury and illness.[9] In fact, MSD cases accounted for 33 percent of all worker injury and illness cases in 2013, according to the U.S. Bureau of Labor Statistics.[10]

In the case of Carpal Tunnel Syndrome, repetitive stress causes swelling and inflammation of tendons, creating pressure on the nerves. Symptoms typically start gradually, with burning, tingling or numbness in the palm and fingers. As symptoms worsen, individuals may experience decreased grip strength, making it difficult to carry out basic manual tasks. Left untreated, Carpal Tunnel Syndrome can result in significant, permanent muscle loss at the base of the thumb.[11] In other overuse injuries, swelling of nerves, tendons and ligaments can result in similar sensations of pain, tingling, weakness and numbness in the fingers, hand and wrist, and can even radiate into the arm, making manual work difficult to impossible to conduct.

The combined cost of lost wages and production, medical expenses and worker's compensation resulting from hand injuries results in a sizable financial toll on individuals and employers alike. Therefore, in any environment where the risk of stress-related hand injury exists, an ergonomic process that uses the principles of an Injury and Illness Prevention Program to address MSD hazards should be considered.[12]

SUPPORTING WORKER PERFORMANCE & PRODUCTIVITY WITH ERGONOMIC GLOVE DESIGN

SELECTING A SINGLE-USE GLOVE

Selecting high-performing, single-use gloves with a certified ergonomic design is a trusted method for reducing muscle effort and supporting occupational hand health and productivity. First and foremost, a protective glove style should be selected based on hazard type and functions being performed. Then, selection may vary based on many factors.

GLOVE STRENGTH AND ELASTICITY

The strength of a single-use glove is of utmost importance to maintaining its protective qualities. However, strength alone can actually work against the ergonomic properties of a glove. Elasticity and modulus are measurements of the glove's ability to stretch and how likely it is to return to its original shape. Taken together these metrics help us understand and quantify how soft or comfortable a glove film may be, as part of a larger equation of overall comfort.

A stiffer glove requires more muscle effort to conduct tasks thereby increasing musculoskeletal pressure, stress and risk of injury. When selecting single-use gloves, look for those that deliver a high level of glove strength, but are constructed of highly pliant materials to ensure both protection and comfort.

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FIT AND GRIP

A glove that is carefully designed to deliver optimum fit ensures superior comfort and maximum range of motion. At the same time, the amount of grip a glove delivers plays a major role in the amount of muscle effort required to securely handle, hold or manipulate objects. Ultimately, innovations in formulation, material type, and texture all contribute to a softer, more comfortable, better fitting and better gripping glove that supports the muscles and the worker alike.

CONCLUSION

Workers rely heavily on their hands to conduct tasks of all kinds, but long-term strain and muscle exertion are recognized risk factors that lead to various MSDs and injuries in nearly every occupation. When employers supply workers with ergonomically-designed, single-use gloves, they can minimize the risk of injury, support compliance, improve worker safety and increase productivity.

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