Development of the *AORN Guidance Statement: Safe Patient Handling and Movement in the Perioperative Setting*

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Introduction

High-risk patient handling tasks lead to work-related musculoskeletal disorders (MSDs) for perioperative registered nurses and other members of the perioperative team. A task force including representatives from AORN, the National Institute for Occupational Safety and Health (NIOSH), the Patient Safety Center of Inquiry at the James A. Haley Veterans Administration Medical Center (VMAC), and the American Nurses Association (ANA) was formed to identify high-risk tasks performed in the perioperative area and to develop evidence-based solutions to minimize MSDs. This is the first in a series of articles to describe ergonomic solutions for high-risk patient handling tasks in the perioperative clinical setting.

Background/Statement of Problem

Perioperative registered nurses and the perioperative team are routinely faced with a wide array of occupational hazards in the perioperative setting that place them at risk for work-related MSDs.[1-3] MSDs are one of the most frequently occurring and costly types of occupational issues affecting nurses.[2,4,5] Nurses working in the private sector had 11,800 MSDs reported in 2001. The majority (nearly 9,000) were back injuries.[5] More than a third (36%) of the injuries requiring time away from work were back injuries.[5] One recent study found that more than half of all nurses (52%) complain of chronic back pain. Another study revealed that 12% of nurses planning to leave the profession indicated back injuries were either a main or contributing factor.[6] A different study identified that concern for personal safety in the health care environment was the reason given by 18.3% of the RNs for leaving the profession.[7] While back injuries are one of the most common occupational injuries in the health care industry, one study found that injuries of the shoulder and neck were more likely to prevent nurses from doing their work than low back pain.[6,8-10] When the demands of the job (eg, physical demands, work environment, workplace culture) are incompatible with the capacity of the worker, the risk of MSDs is increased.[1,2,11] The connection between risk factors and MSDs is stronger when exposures are intense and prolonged and when there are several risk factors present at the same time.[12]

The consequences of MSDs are severe. Employees who experience pain and fatigue are less productive, less attentive, more prone to make consistent mistakes, and more susceptible to injury, and they may be more likely to affect the health and safety of others. Nurses suffering from disabling back injuries and fear of being injured have contributed to the number of nurses leaving the profession, thus increasing the nursing shortage. Workplaces with high incidences of MSDs report increases in lost/modified workdays, higher staff turnover, increased costs, and adverse patient outcomes.[7,13-15] The purpose of this project was to identify high-risk tasks in perioperative nursing practice and to design ergonomic solutions to eliminate or reduce occupational risk to workers in these clinical settings.

AORN regards the well-being of the perioperative team members as paramount to the provision of safe patient care. The physical demands of the perioperative environment expose perioperative health care providers to high-risk tasks that put them in jeopardy of MSDs. A safe workplace is necessary to have a positive impact on the health and well-being of both the patient and the health care provider. AORN is committed to providing resources for the development of a safe perioperative work environment. For this reason, the Association contacted Audrey Nelson, PhD, RN, FAAN, to develop a plan to address the unique risks associated with perioperative practice.

Methods

An expert panel was convened to address risk factors for musculoskeletal disorders for registered nurses and other members of the perioperative team. Due to the complexity of the issues, the interdisciplinary panel included experts in perioperative nursing, ergonomics, biomechanics, engineering, industrial hygiene, and injury

prevention. The professional nurse representatives included clinical, administrative, education and research perspectives. The expert panel included partnerships from the National Institute for Occupational Safety and Health, the James A. Haley Veterans Administration Medical Center Patient Safety Center of Inquiry (Tampa, Fla), the American Nurses Association, and AORN.

The panel met over an 18-month period in face-to-face meetings, conference calls, and electronic communications until panel members were able to achieve consensus. Through systematic assessment of task demands, direct measurement of weights and forces involved in the tasks, and direct observation of work tasks and equipment, the panel applied ergonomic principles to develop clinical tools for utilization in the perioperative area with the goal of reducing work-related MSDs.

The clinical tools were developed based on professional consensus and evidence from research and were pilot-tested in several facilities. Initially, the team developed a comprehensive list of tasks performed by OR nurses that were physically demanding or contained physically demanding elements. The range of tasks was evaluated and condensed into a list of seven specific tasks of interest. After the seven tasks were identified, the team developed ergonomic tools using the following process.

1. All members of the expert panel discussed each task and provided input into how the task was performed.
2. The professional nurses on the team identified the various physical task requirements of the selected task.
3. Based upon this initial assessment, the technical experts on the team then selected the most important risk factors associated with the task (eg, pushing, pulling, lifting), selected the most appropriate criteria for determining recommended exposure limits for the identified risk factors, and developed weight and force limits for the specific tasks that appear in the decision logic for each tool.

The process used by the ergonomists to develop the weight or force limits involved

- selecting the appropriate physical constraint criteria,
- evaluating the various tasks, and
- calculating strength and lifting capability limits based on the selected constraints.

For each tool, the developers provided a rationale for the selected criteria and how weight and force limits were calculated. Empirical data were used to derive the recommended maximum forces and weights for manual handling for a wide range of tasks performed in the OR work environment. These ergonomic tools were based on consensus and ergonomic criteria typically used in assessing the physical demands of manual handling activities.

Identification of High-Risk Tasks

The first step in the process was to identify high-risk tasks performed in the perioperative setting. High-risk tasks include job demands that push the limits of human capabilities—eg, heavy loads, sustained awkward positions, bending and twisting, reaching, fatigue or stress, force, or standing for long periods of time. It is the combination of frequency, duration, and stress of these tasks that predispose nurses to MSDs. Furthermore, the perioperative setting has some unique challenges due to the use of anesthesia rendering patients unable to assist in movement and needing further protection from injury. Several high-risk tasks have been identified in operating room settings, including the following.

Lateral transfer from stretcher to OR bed[2,3,13]

Few would argue that one of the highest risk patient handling tasks is patient transfer. Patient transfers can start with the patient in a sitting position (ie, vertical transfer) or when the patient is supine (ie, lateral transfer).[16] Lifting and moving patients is a frequent occurrence in the perioperative setting. Patients are transferred to and from transport carts and the OR bed. Patients are repositioned once they are on the OR bed. The perioperative setting poses a unique challenge in that many of the patients are completely or partially dependent due to general or regional anesthesia or sedation. Patients who are unconscious cannot move or feel pain and must be protected from injury. This often requires members of the perioperative team to manually lift the patient or the patient's extremities several times. The position required, and the size and weight of the patient, may increase the risk for MSDs to perioperative team members. This problem is exacerbated with large or obese patients.

Repositioning patients on OR beds[2]
To access key body parts, the patient often must be repositioned on the OR bed. Further, the perioperative nurse monitors patient body alignment and tissue integrity during long procedures and may need to reposition the patient.

Lifting and holding legs, arms, head for prepping[2,13]
Preparing a limb for surgery generally requires the limb to be raised in order to complete circumferential skin preparation. The limb can be suspended by a person holding the limb or by using a holding device. When the limb is held manually during the entire skin prep, it is usually done by one person while a second person performs the skin prep. In some instances, if the limb is small or only the distal portion needs to be prepped, the person performing the skin prep also may hold the limb. If a holding device is used, the limb still needs to be lifted to complete the prep on the area resting on the holder. The person lifting the extremity needs to hold the limb far from his or her body to maintain asepsis. The size of the limb, length of time held, posture necessary to hold the extremity, and physical ability of the person doing the holding all contribute to the ability of the caregiver to safely perform this task.

Prolonged standing[2]
Perioperative registered nurses also are prone to pain and fatigue from static posture during surgical procedures. The sterile perioperative team members are most likely to stand in one place for extremely long periods of time. The sterile team members must maintain the integrity of the sterile field, which prevents them from changing levels by sitting in a chair that is lower than the sterile field to rest and then standing up again. Both acute and chronic back, leg, and foot pain are frequent complaints resulting from standing in one place for long periods of time.

Holding retractors for extended periods of time[2]
In addition to standing for long periods of time, perioperative team members performing in the role of first assistant may be required to hold retractors or body parts for long periods of time. Manual retraction provides exposure of the operative site and is accomplished by gripping and pulling on a retractor or using the hand to retract or steady organs. This manual retraction often results in awkward posture. The height of the surgical field in relation to the person providing retraction influences the risk for MSDs.[17] Prolonged standing, trunk flexion, neck flexion, and arms held higher than the optimal working height place perioperative team members at risk for MSDs.

Lifting and carrying supplies/equipment[2,3,13]
Perioperative personnel frequently are required to carry unsterile and sterile supplies, instrument trays, and other equipment. The weight of an instrument set can vary, but sets can weigh as much as 40 pounds. Sterile instrument sets are wrapped in impervious nonwoven material or contained in closed, hard-surfaced container systems. Both methods can present lifting and carrying problems. Heavy wrapped instrument sets have no handles and are difficult to carry. Container systems have handles but may increase the weight of the tray. In an effort to keep cost down and conserve storage space, instrument trays may be loaded with too many instruments to be safely carried. Removing large instrument sets that have been flash sterilized places the staff at risk for injury. To maintain sterility of the sterilized items, a person must lift and hold the sterile instrument pan away from his or her body. The weight of the pan and the height of the person removing the pan contribute to the degree of MSD risk to the individual.

Pushing, pulling, moving equipment on wheels[2,3,13]
Perioperative nurses and other perioperative personnel are frequently required to move (ie, by pushing or pulling) heavy equipment (eg, OR beds, portable microscopes, portable C-arm imaging machines) several times during the day. These machines are very expensive and often must be shared between several individual operating rooms. OR beds are very heavy and difficult to move by themselves, even without a patient. When an OR bed is moved with a patient on it, the risk of injury increases for both the worker and the patient.

Review Process

Once the expert panel had completed its work, an extensive peer review process was undertaken to refine the ergonomic solutions. The reviewers included nationally known experts in ergonomics, biomechanics, engineering, industrial hygiene, and injury prevention. The panel also obtained administrative reviews from NIOSH, ANA, and the Veterans Health Administration

(VHA), as well as technical review from NIOSH. To ensure that the document could be generalized across diverse clinical settings, the reviewers included perioperative nurses working in all phases of the perioperative setting (ie, preoperative, intraoperative, postoperative areas). Surgery and other invasive procedures are performed in multiple settings that require patient transfer, patient positioning, lifting and holding body parts, lifting and carrying equipment and supplies, pushing/pulling equipment, standing for long periods of time, and holding retractors. These setting include, but are not limited to, inpatient operating rooms, ambulatory surgery centers, office-based surgery centers, and interventional procedure units.

A total of 88 clinical and ergonomic experts were sent requests for review and comment based on their ergonomic expertise or perioperative clinical and/or management experience. The panel was asked to review the document from their individual area of expertise for clinical applicability, technical accuracy, relevance, and usefulness. An organized process included the use of a formal comment form and a specific time frame. Comments were collated and evaluated by the task force for acceptance, and the document was modified as appropriate.

Overview of Solutions

The task force created solutions for each high-risk task identified in perioperative settings. Using principles of ergonomics, scientific evidence, and clinical trials conducted at the VA Patient Safety Center of Inquiry, the following solutions were developed. A brief description of each of the seven tools is included in this article.

The **Algorithm for Safe Lateral Transfer** from the stretcher to and from the OR bed was developed to standardize decision making about the number of staff and type of technology needed to perform this task safely.

The **Algorithm for Safe Positioning/Repositioning the Patient** on the OR bed to and from the supine position was developed to standardize decision making about the number of staff and type of technology needed to perform this task safely.

The **Guidelines for Safe Lifting and Holding Legs, Arms, and Head for Prepping** were developed to identify safe time limits for one-handed and two-handed lifts for each body part.

The **Algorithm for Prolonged Standing** was developed to standardize decision making about the time limits and type of technology needed to perform the task safely.

The **Algorithm for Retraction** was developed to standardize decision making about the type of technology and techniques needed to perform the task safely.

The **Guidelines for Lifting and Carrying Supplies and Equipment** were developed based on the NIOSH Lifting Index.[18,19] This tool includes recommendations for 14 common types of equipment used in the OR. These guidelines were based on weight lifted, horizontal distance, vertical location origin and destination, and distance carried and indicate the level of risk (ie, minimal risk, potential, or considerable) for each task.

The **Guidelines for Safe Pushing, Pulling and Moving Equipment on Wheels** were developed, based on Liberty Mutual's push force limits for several devices commonly used in the OR, to standardize the number of staff and types of technology needed to perform the task safely.

Future Plans

The final document, "AORN guidance statement: Safe patient handling and movement in the perioperative setting," was reviewed by NIOSH, ANA, VHA, and AORN and was subjected to extensive peer review on a national level. It also will undergo pilot testing; the next step is to test the tools and algorithms in different types of perioperative settings. The variety of facilities that perform surgery or other invasive procedures include metropolitan inpatient hospitals, trauma hospitals, rural hospitals, freestanding ambulatory surgery centers, hospital-based ambulatory surgery facilities, and office-based surgery centers. Organizations testing the tools will be asked to evaluate the applicability, acceptance, and availability of the recommended technology.

The wide adoption of safe ergonomic practices will help to promote a safe perioperative work environment and protect perioperative team members. To that end, AORN will seek educational opportunities and endorsement by other perioperative disciplines. This article serves as the first in a planned series to provide detailed justification for each solution identified in the guidance statement.

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Table of Contents