Development of the National Association of Orthopaedic Nurses Guidance Statement on Safe Patient Handling and Movement in the Orthopaedic Setting

Carol A. Sedlak ▼ Margaret O. Doheny ▼ Audrey Nelson ▼ Thomas R. Waters

High-risk patient-handling tasks lead to work-related musculoskeletal disorders for orthopaedic nurses and other members of the healthcare team who are involved in moving patients with orthopaedic issues. Serious consequences can arise from manually moving/lifting these patients. A task force was organized that included representatives from the National Association of Orthopaedic Nurses, the Patient Safety Center of Inquiry at the James A. Haley Veterans Administration Medical Center in Tampa, the National Institute for Occupational Safety and Health, and the American Nurses Association to identify high-risk tasks performed in the orthopaedic setting and to develop evidence-based solutions to minimize the risk of musculoskeletal disorders. High-risk tasks for moving and lifting orthopaedic patients were identified. Four orthopaedic algorithms and a clinical tool were developed by the task force to direct nurses and healthcare team members caring for orthopaedic patients through the use of scientific evidence and available safe patient-handling equipment and devices.

The National Association of Orthopaedic Nurses (NAON) is the professional nursing association for orthopaedic nurses, established in 1980. The NAON's mission is to advance the quality of musculoskeletal healthcare by promoting excellence in research, education, and nursing practice (NAON, n.d.). In 2006, the NAON *Safe Patient Handling and Movement* Task Force was developed and consistent with the mission of the organization, the focus of the initiative was to provide evidence-based and practical ergonomic methods for safe patient handling of orthopaedic patients to prevent injuries for nurses, patients, and healthcare personnel (Sedlak, 2006).

Tasks involved in handling high-risk patients lead to work-related musculoskeletal disorders (MSDs) for orthopaedic nurses and other members of the healthcare team. A task force including representatives from NAON, the Patient Safety Center of Inquiry at the James A. Haley Veterans Administration Medical Center (VAMC), the National Institute for Occupational Safety and Health (NIOSH), and the American Nurses Association (ANA) was formed to identify high-risk tasks performed with orthopaedic patients and to develop evidence-based solutions to minimize MSDs (see Figure 1). The task force was built upon the work of the Association of periOperative Registered Nurses, the Patient Safety Center of Inquiry at the James A. Haley VAMC, NIOSH, and ANA, which identified high-risk tasks and developed algorithms for the perioperative setting. The evidence-based solutions for high-risk patient-handling tasks in the orthopaedic clinical setting are introduced in this first of a series of articles.

Background/Statement of the Problem

The ANA launched the Handle With Care campaign in 2003 to prevent back and MSD injuries among healthcare workers (ANA, 2003). Orthopaedic nurses and the healthcare team are routinely faced with a wide array of occupational hazards while caring for patients with orthopaedic issues in a variety of settings that place them at risk for work-related MSDs (de Castro, 2004; Nelson & Baptiste, 2004).

Carol A. Sedlak, PhD, RN, CNS, ONC, CNE, Professor, Kent State University, College of Nursing, Kent, OH.

Margaret O. Doheny, PhD, RN, CNS, ONC, CNE, Professor, Kent State University, College of Nursing, Kent, OH.

Audrey Nelson, PhD, RN, FAAN, Director, Patient Safety Center of Inquiry, James A. Haley VAMC, Tampa, FL.

Thomas R. Waters, PhD, CPE, Research Safety Engineer, Division of Applied Research and Technology, NIOSH, Cincinnati, OH.

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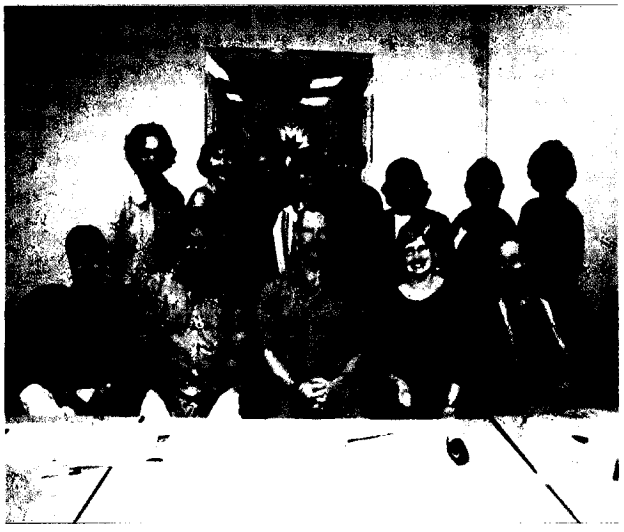

FIGURE 1. NAON safe patient handling and movement task force.

The reliance on body mechanics has not been shown to be effective and is not evidence-based practice. Even with the evidence that these techniques are not effective, education in body mechanics and lifting techniques remains the primary solution used by healthcare facilities in the United States (Nelson & Baptiste, 2004). Over the past three decades, there is a growing body of evidence to support interventions that are effective or show promise in reducing musculoskeletal pain and injuries in healthcare providers, but these techniques are not being incorporated into practice settings.

The risk factors that orthopaedic nurses encounter in the workplace account for many MSDs such as back and shoulder injuries that have serious consequences for the nurse. Musculoskeletal disorders are associated with excessive back and shoulder loading from manual patient handling, applying excessive forces during pushing and/or pulling of objects, awkward posturing during patient care, and working long hours (Waters, Collins, Galinsky, & Caruso, 2006). Consequences of these MSDs to the nurse include career-ending injuries, higher susceptibility to future injury, and fear of injury, whereas organizational impacts include high cost of worker's compensation insurance, increased sick leave, pain and fatigue, and diminished productivity (Nelson, 2006). On the basis of an assessment of patient-lifting tasks using the Revised NIOSH Lifting Equation, it was recently reported that the maximum weight that should be lifted manually by a nurse under ideal conditions (load close to the body and vertical height at waist height) was 35 lb and that the weight limit would decrease as lift became less than ideal (e.g., arms extended; Waters, 2007).

In 2006, registered nurses had the fifth highest number of MSDs in the United States, exceeding even the traditional laboring occupations of truck driver, construction laborer, and maintenance worker (U.S. Department of Labor Bureau of Labor Statistics, 2007). Musculoskeletal disorders are one of the most frequently occurring and costly types of occupational issues affecting nurses. This heightened awareness has changed the paradigm on how nurses are educated and has resulted in a study by NIOSH, the Patient Safety Center of Inquiry at the James A. Haley VAMC, and ANA to educate nursing students and faculty about safe patient-handling evidence-based practice through the use of a curriculum module (Menzel, Hughes, Waters, Shores, & Nelson, 2007; Nelson et al., 2007; Powell-Cope, Hughes, Sedlak, & Nelson, 2008). Relying solely on the use of body mechanics to protect healthcare workers while moving and lifting patients is no longer safe practice.

The purpose of this project was to identify high-risk tasks involved in caring for orthopaedic patients and to design ergonomic solutions to eliminate or decrease occupational risk to healthcare staff working in these clinical areas.

Description of the Process

The following is a chronology of the work conducted by the NAON Safe Patient Handling Task Force that resulted in development of this *Guidance Statement on Safe Patient Handling and Movement in the Orthopaedic Setting*. In 2005, one of the authors (Sedlak) approached NAON leadership to consider that NAON become a leader in orthopaedic safe patient handling. In March 2006, an informational conference call meeting with NAON leadership and Dr. Audrey Nelson (one of the authors) was held to discuss involvement with NAON in the safe patient-handling initiative. The NAON Executive Board approved development of a task force to provide evidence-based and practical ergonomic methods for safe patient handling. In June 2006, the task force was formally established to address orthopaedic risk factors for MSDs for nurses and other healthcare providers. Members of the task force (Table 1) included interdisciplinary representatives of NAON, James A Haley Veterans Hospital Patient Safety Center, NIOSH, and ANA.

In July 2006, the task force had an initial conference call with Dr. Nelson to establish a plan of action. The plan included seeking input from the NAON membership to identify tasks considered to be high risk when lifting and moving orthopaedic patients. In August 2006, 45 NAON members responded to the call for input on the NAON Web site to identify high-risk tasks and submitted their list electronically to a dedicated e-mail address. Members were asked for input about tasks that orthopaedic nurses perform, that are specific to orthopaedic nursing, and that could be considered high risk for musculoskeletal injury. These could be high-frequency tasks or those that put a great amount of stress on the body or tasks that are very complicated and may be done over a long period of time.

In preparation for the face-to-face meeting in October 2006, data from the NAON membership survey were collated into a list of high-risk tasks by two task force members and were presented to the NAON representatives of the task force during a conference call. During the phone meeting, a prioritized list of the high-risk activities was developed. These included caring for patients with

1. postoperative total hip replacement (THR),
2. cast/splint on an extremity,

TABLE 1. MEMBERS OF THE NAON TASKFORCE

National Association of Orthopaedic Nurses (NAON)
- Cynthia M. Gonzalez, MSN, RN, ONC, APN, Past President, NAON; Nurse Educator, Weiss Memorial Hospital, Chicago, IL
- Peggy Doheny, PhD, CNS, ONC, CNE, Professor, Kent State University, College of Nursing, Henderson Hall, Kent, OH
- Cynthia (Cindy) M. Howe, MSN, RN, ONC, Immediate Past President, NAON; Director, Transitional Care Unit, City Hospital, Martinsburg, WV
- Miki Patterson, PhD, RN, NP, ONC, Immediate Past President, NAON; UMass Memorial Trauma Center, Worcester, MA
- Carol A. Sedlak, PhD, RN, CNS, ONC, CNE, Professor, Kent State University, College of Nursing, Henderson Hall, Kent, OH

Patient Safety Center of Inquiry, James A. Haley VA Hospital, Tampa, FL
- Andrea, Baptiste, MA (OT), CIE, Ergonomist/biomechanist
- Valerie Kelleher, AA, Information Specialist
- John D. Lloyd, PhD, MErg.S, CPE, Director, Research Laboratories
- Mary W. Matz, MSPH, VHA Patient Care Ergonomics Consultant, Industrial Hygienist
- Audrey Nelson, PhD, RN, FAAN, Director, Patient Safety Center of Inquiry, James A. Haley VAMC, Tampa, FL

National Institute for Occupational Safety and Health (NIOSH)
- Thomas R. Waters, PhD, CPE, Research Safety Engineer, Division of Applied Research and Technology, NIOSH, Cincinnati, OH

Diligent
- Stephanie Radawiec, PT, MHS, Clinical Consultant, Roselle, IL

Guldmann, Inc.
- Patricia Mechan, PT, MPH, CCS, Consulting, Education & Clinical Services; Manager, Brookline, MA

American Nurses Association
- Nancy Hughes, MS, RN, Director, Center for Occupational and Environmental Health, Silver Springs, MD

3. orthopaedic equipment—continuous passive motion,
4. halo vest (logrolling for dressing changes),
5. holding extremity for procedure,
6. altered gait pattern—platform walker,
7. assembling traction,
8. transfers into a car,
9. moving children with disabilities, and
10. transfers of patients with pelvic and external fixators.

To help explain the various high-risk orthopaedic activities to all members of the task force, a script and a scenario were developed for each task. Each high-risk activity was videotaped at clinical sites by the NAON leaders and these video vignettes were presented at the October 2006 face-to-face meeting.

Objectives for the October 2006 in-person meeting were (1) to identify high-risk tasks in orthopaedic nursing, (2) develop algorithms or assessment tools to guide decision making regarding each high-risk task, (3) to develop a plan to validate the algorithms/tools, and (4) to develop a plan to disseminate these algorithms/tools widely. During the meeting, two members presented a summary of the literature on high-risk tasks in orthopaedics to substantiate the gap in knowledge for moving and lifting orthopaedic patients. In the review of literature, using key terms, 15,000 articles were identified, of which 400 were research based. Of these, few focused on ergonomic research applied to orthopaedics. The group discussed the gaps in the research literature. The videos were then reviewed and the task force dialogued about each high-risk task. The list of high-risk tasks was prioritized on the basis of physical demand, posture, and frequency, and duration of tasks was rated on a scale of 1–5 with 5 being the worst. The list was finalized and two work groups were formed to begin developing the algorithms. Each of the two task force groups had an ergonomist and an orthopaedic nurse member. These tasks were as follows.

WORKGROUP 1

1. Vertical transfer of a postoperative THR patient
2. Logrolling of a of a postoperative THR patient
3. Vertical transfer of a patient with a cast/splint on an upper extremity
4. Vertical transfer of a patient with a cast/splint on a lower extremity
5. Bedside setup of the continuous passive motion equipment and
6. Logrolling of a patient in a halo vest

WORKGROUP 2

1. Holding an extremity for procedure
2. Ambulation of orthopaedic patient using platform walker
3. Bedside assembly of traction
4. Vertical transfer of orthopaedic patient from wheelchair to vehicle
5. Vertical transfer of physically dependent child
6. Lateral transfer of physically dependent child
7. Vertical transfer of patient with pelvic and external fixators
8. Lateral transfer of patient with pelvic and external fixators

The work for developing the algorithms (a set of steps for solving a particular problem) began and included directions on how to construct the algorithm, using figures in the shape of rectangles, diamonds, and triangles. Each algorithm included a comment section for further explanations. The two groups discussed and presented their preliminary algorithms to the entire task force. The meeting closed with directions for each group to refine the algorithms and each work group scheduled a conference call to discuss and complete the draft of the algorithms by mid-2007.

In late 2006, the November/December 2006 issue of *Orthopaedic Nursing* (the official journal of NAON) featured a guest editorial by Dr. Sedlak (2006) on "Nurse Safety: NAON's Role in Preventing Workplace Musculoskeletal Injury." Three articles in the issue

addressed ANA's Handle with Care campaign (de Castro, 2006), evidence-based practices for safe patient handling (Nelson & Baptiste, 2006), and NIOSH research efforts to prevent MSDs in the healthcare industry (Waters et al., 2006).

Throughout 2007, the task force group dialogued during conference call meetings to continue refining the algorithms. In November 2007, the full task force met to review the algorithms and discuss logistic issues. As a result, a finalized list of four algorithms and a clinical tool was identified and completed on the basis of the commonalities and overlap of some of the algorithms from the original set of 10 high-risk tasks. The following is a discussion of each high-risk task.

High-Risk Tasks

Turning an Orthopaedic Patient in Bed (Side to Side)

Turning patients with orthopaedic impairments from side to side in bed is a common activity. Patients are often repositioned to maintain alignment of the spine, limbs, and other body parts that have been injured or had surgical procedures. Individuals may have equipment attached to their body such as halo vests or external fixators to stabilize fractures. This can make turning in bed difficult, especially if the patient is experiencing pain, has altered levels of consciousness, or is uncooperative. The nurse or healthcare worker will need to move and turn the individual several times a day. It is imperative that the nurse and healthcare workers remain safe while moving the patient because the weight of the patient with the added equipment may increase the risk for injury.

Vertical Transfer of a Postoperative Total Hip Replacement Patient

Moving a patient who has had a THR from a supine position to sitting on the side of the bed position is a common activity performed by nurses. This task requires adherence to positional constraints identified by the surgeon so that the hip does not become dislocated. Orthopaedic precautions need to be followed that may include weight-bearing limits on the lower extremities, abduction of the legs, prevention of internal rotation, and avoidance of hip flexion less than 90°.

Vertical Transfer of a Patient With an Extremity Cast/Splint

Moving a patient with a cast or splint on an extremity is commonly performed by nurses. The patient's level of pain, fatigue, and ability to cooperate and support the limb are all variables that make this task high risk. Additional risks to the caregiver include lifting heavy casts, traction weights, awkward postures, pushing/pulling, and twisting. During cast application, the limb must be held for a long period of time, making this task difficult due to the need to support the limb during the circumferential wrapping of the cast materials. The weight of the limb being lifted should not exceed the strength/capability of the caregiver.

Ambulation

Ambulation of an orthopaedic patient, an intervention critical to reducing postoperative complications, is essential to reducing complications of immobility. Limitation of weight-bearing status, inability to grasp with the hand, and the use of various immobility devices such as splints can make this task more difficult. The risk to the patient for falls is an additional concern.

Lifting or Holding a Limb With or Without a Cast or Splint

The task of lifting and holding limbs (arms or legs) during casting or splinting is performed often in the orthopaedic setting. The weight of a limb can be heavy and the physical demands of performing this task can often exceed the back and shoulder strength capability of the caregiver. When the demands of the task exceed the strength capability of the worker, risk of MSD increases (National Research Council/Institute of Medicine, 2001). In cases in which the weight of the limb exceeds recommended limits for one caregiver, then either additional help will be needed to perform the task or some type of assistive technology should be used.

Review Process

The algorithms and clinical tool were reviewed by members (registered nurses) of NAON and individuals from the VAMC, NIOSH, and ANA who included experts in orthopaedic nursing, ergonomics, biomechanical engineering, industrial hygiene, and injury prevention. Fifty-four individuals were sent requests to review the algorithms/clinical tools and provide electronic feedback using SurveyMonkey. Twenty individuals completed the survey. The survey included the following five open-ended questions:

1. Describe any questions or problems you had regarding the flow for each algorithm from the starting point to each of the various decision points.
2. Describe any questions or problems you had regarding the proposed solutions for each algorithm.
3. Identify ways to make the footnotes clearer, practical, or more user-friendly.
4. Identify any practical issues that would interfere with the use of this algorithm across clinical settings in the United States.
5. Other comments or suggestions?

The feedback was collated and distributed to the task force who conducted an extensive review of the data prior to the task force conference call. Feedback was discussed and evaluated by the task force for acceptance.

Reviews provided in-depth descriptive feedback that was very useful. For example, feedback addressing the overall flow of the algorithms included adding more assessment detail of patients' ability to stand and move. As a result of this feedback, the task force decided to include a generic assessment tool that had been developed by the VAMC (see Table 2).

Feedback addressing questions or problems regarding proposed solutions for each algorithm often focused on the lack of equipment available in agencies to move

TABLE 2. ASSESSMENT CRITERIA AND CARE PLAN FOR SAFE PATIENT HANDLING AND MOVEMENT

I. Patient's level of assistance:

_____ Independent—Patient performs task safely, with or without staff assistance, with or without assistive devices.
_____ Partial assist—Patient requires no more help than standby, cueing, or coaxing, or caregiver is required to lift no more than 35 lb of a patient's weight.
_____ Dependent—Patient requires nurse to lift more than 35 lb of the patient's weight, or is unpredictable in the amount of assistance offered. In this case, assistive devices should be used.

An assessment should be made prior to each task if the patient has varying level of ability to assist due to medical reasons, fatigue, medications, etc. When in doubt, assume the patient cannot assist with the transfer/repositioning.

II. Weight-bearing capability

_____ Full
_____ Partial
_____ None

III. Bilateral upper extremity strength

_____ Yes
_____ No

IV. Patient's level of cooperation and comprehension:

_____ Cooperative—may need prompting; able to follow simple commands.
_____ Unpredictable or varies (patient whose behavior changes frequently should be considered as "unpredictable"), not cooperative, or unable to follow simple commands.

V. Weight: _____ Height: _____
Body mass index (BMI) [needed if patient's weight is over 300][a]:_____

If BMI exceeds 50, institute bariatric algorithms

The presence of the following conditions are likely to affect the transfer/repositioning process and should be considered when identifying equipment and technique needed to move the patient.

VI. Check applicable conditions likely to affect transfer/repositioning techniques

_____ Hip/knee/shoulder replacements _____ Respiratory/cardiac compromise _____ Fractures
_____ History of falls _____ Wounds affecting transfer/positioning _____ Splints/traction
_____ Paralysis/paresis _____ Amputation _____ Severe osteoporosis
_____ Unstable spine _____ Urinary/fecal stoma _____ Severe pain/discomfort
_____ Severe edema _____ Contractures/spasms _____ Postural hypotension
_____ Very fragile skin _____ Tubes (IV, chest, etc.)

Comments:_____
_____
_____
_____

VII. Appropriate lift/transfer devices needed:

Vertical lift:
Horizontal lift:
Other patient handling devices needed:
Sling type: Seated_____ Seated (head support) _____ Seated (amputee)_____ Hygiene_____ Supine_____ Ambulation_____
Limb support_____
Sling size: _____
Signature: _____ **Date:** _____

[a]For online BMI table and calculator, see http://www.nhlbi.nih.gov/guidelines/obesity/bmi_tbl.htm

and lift patients. Several reviewers requested alternatives to using lifting equipment. It became obvious to the task force that nurses are not aware of the scientific evidence that emphasizes the technological advances and use of equipment for safe patient handling.

Healthcare providers can no longer rely on body mechanics for moving and lifting patients. There are gaps in administration and resources, and nurses would rather rewrite safe patient handling to fit the existing available resources than use evidence-based practice. Although there are practice barriers to implementing safe patient movement in clinical settings, this was not a rationale for the task force to change the algorithms. Resources need to be allocated to obtain the lifting equipment so that the standards of safe patient-handling practice are not jeopardized. A good example is the change in clinical practice related to needle stick precautions. Although the evidence and the technology existed, healthcare agencies were slow to implement the technology due to the increased costs. Although agencies incurred an expense in providing the safer equipment, they embraced the technology and it has become a standard of practice to protect healthcare staff. Likewise, similar attitudes are being seen in using safe patient handling technology. Nurses need to be assertive in communicating to administrators the

scientific evidence for safe patient handling; technology is available and the orthopaedic algorithms are intended to become standards of practice.

The feedback addressing identification of ways to make the footnotes clearer, practical, or more user-friendly included suggestions to incorporate more detailed footnotes on using the lifting devices and the slings and how to maintain total hip precautions. The task force determined that for each algorithm to be on one page, the focus had to be on the pictorial representation of the decision making for determining the type of equipment to use for the specific situation. Other feedback included the need for defining weight bearing and this was addressed within the space constraints of the algorithm.

Feedback addressing identification of practical issues that would interfere with the use of this algorithm across clinical settings in the United States continued to address alternatives to using the lifting/moving technology. The task force group suggested that NAON develop a poster of the algorithms that can be displayed on the clinical unit in the nurses' report room. The task force decided to house the algorithm document on the NAON Web site so that it is easily accessible to both NAON members and nonmembers such as physical therapists.

The last category of feedback asked for other comments or suggestions. Originally, the tools with calculation tables were to be used in conjunction with the algorithms of vertical transfer of a patient with a cast or splint on an upper/lower extremity but were interpreted as two additional algorithms. The task force changed the title of the calculation tables to "clinical tools."

In summary, the algorithm feedback was used as a basis for a final review at a task force conference call meeting. Overall, the algorithms were on target and the feedback helped with the clarity of the presentation and fine-tuning. The algorithms/clinical tools were modified and finalized. The final draft was presented at the 8th Annual Safe Patient Handling and Movement Conference in Orlando, FL, March 2008 and the 2008 NAON Congress in San Jose, CA.

Overview of the Solutions

Solutions for the orthopaedic tasks with high risk for MSDs were developed by the task force. These were based on principles of ergonomics and scientific evidence. The generic algorithms developed by the Patient Safety Center of Inquiry (Tampa, FL), Veterans Health Administration and Department of Defense (Patient Care Ergonomics Resource Guide, 2005) provided a foundation for the orthopaedic specialty algorithms.

The four algorithms and one clinical tool are briefly described below. An algorithm is defined as a tool that proceeds through sequenced decision steps leading to delineation of a patient care ergonomic solution that includes recommendations for specific technologies and minimum number of caregivers needed to perform the task safely. The clinical tool consists of tables of recommended weight limits for lifting and holding limbs. The algorithms are designed to assist healthcare employees in selecting the safest equipment and techniques based on specific patient characteristics. These guidelines were prepared on the basis of scientific and professional information. Users of this guideline should periodically review this material to ensure that the advice herein is consistent with current reasonable clinical practice. As with any guideline, this content provides general direction; professional judgment is needed to ensure safety of patients and caregivers. Table 2 depicts a form that can be used in patient care areas for assessing patients prior to each task and selecting a particular algorithm. A detailed description of each algorithm and clinical tool is featured in this supplement.

1. Orthopaedic Algorithm 1: for turning a patient in bed (side to side)
2. Orthopaedic Algorithm 2: for vertical transfer of a postoperative THR patient (bed to chair, chair to toilet, chair to chair, or car to chair)
3. Orthopaedic Algorithm 3: Vertical transfer of a patient with an extremity cast/splint
4. Orthopaedic Algorithm 4: for ambulation
5. Clinical tool for lifting and holding limbs including alternate method for determining weight limits for lifting and holding limbs. Tables provide time and weight limits for one-handed and two-handed lifts of upper and lower extremities and formulas for calculating time and weight limits for one-handed and two-handed lifts of upper and lower extremities, with and without casts.

Future Plans

Each of the four algorithms and the clinical tool are presented in this *Orthopaedic Nursing* Supplement. Explanatory materials are incorporated in this document. This will be disseminated in presentations and Web sites as well. After publication and dissemination of the algorithms, the next step is to plan for evaluation, testing, and peer review on a national level through the NAON, ANA, NIOSH, and VAMC Web sites and through NAON orthopaedic special interest focus groups representing a broad range of practice areas from short-term care to long-term care and community. Groups testing the algorithms will be asked to evaluate the applicability, value, ease of use, acceptance, and availability of the technology recommended in the algorithms.

The adoption of safe patient movement practices will help facilitate a safe and improved orthopaedic work environment, protecting healthcare members. The National Association of Orthopaedic Nurses will explore further educational opportunities and support to disseminate the information. This article is the first in a series of articles to provide detailed information for each solution in the form of an algorithm that has been identified in this article.

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