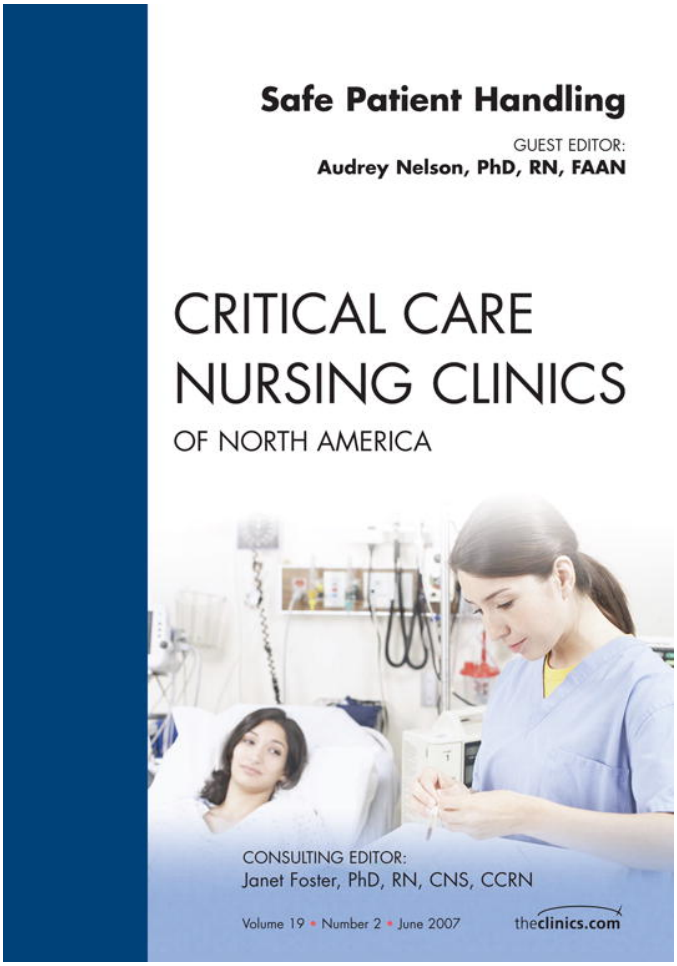

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Safe Patient Handling Program in Critical Care Using Peer Leaders: Lessons Learned in The Netherlands

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An ergonomic approach in acute care

In the Netherlands, the ergonomic approach is advocated as the most effective way to prevent musculoskeletal disorders among health care workers. In the literature, this is referred to as a nonlifting or minimal lifting approach, and there is evidence of the effect of such an approach and of the lack of effect of other approaches [1–3]. The primary objective is to eliminate or substitute all potentially harmful actions. For this purpose, guidelines were developed mainly based on the National Institute of Occupational Safety and Health (NIOSH) guidelines for manual handling of loads [4]. Patients or objects in excess of these limits should not be lifted or transferred manually. This approach has been enhanced over the past 4 years through working environment covenants—signed agreements ensuring commitment by a range of national parties. The initial drive for these covenants originates from the European Union guidelines for promoting safe work practices. In nearly all health care sectors (acute and critical care, nursing homes, home care, psychiatric care, and care for the handicapped) employers, workers (unions), and government have, on the basis of these convenants, worked together to decrease the exposure of nurses to physical overload. The focus of the convenants is not restricted to a nonlifting approach, but all major sources of physical overload (lifting and transferring patients, pushing, pulling, postural load, reaching, prolonged standing, and so forth) are taken into account.

This article briefly overviews the implications of this development for critical care in hospitals. In the Netherlands, this applies to a group of 110 hospitals across the country, which has a total population of approximately 16 million people. For the purpose of this article, the group of eight academic teaching hospitals has been excluded, which, as a group, have taken a slightly different approach.

This article provides insight into the development of the guidelines, the implementation process, and preliminary results.

Analysis of the ergonomic situation in acute and critical care

The first step was to assess the exact nature of the ergonomic problems encountered in critical care. For this purpose, research material from different sources was collected and the conclusions were combined. Methods used were surveys, observations, and direct measurements of exposure.

Prevalence of musculoskeletal disorders

In a survey of 4129 nurses from a convenience sample of 27 hospitals (average nurse response rate 68% [50%–100%] per hospital; hospitals evenly distributed across the country), it was clear that there are back pain problems but also that the back pain prevalence differs widely between hospital wards [5]. The average 12-month back pain prevalence of all nurses responding was 63%. This is high compared with the average for

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the Dutch general population (42%) but slightly lower than the Dutch average for home care in that period (67%). Preventive action, therefore, was considered relevant and necessary. It also was clear that there were large differences between different specialties in a hospital. Surgery, cardiac critical care units, ICU, emergency departments, cardiology in general, orthopedics, and neurology reported a higher prevalence, the latter two ranking first and second. Alternatively, specialties, such as gynecology, pediatrics, and internal medicine, reported prevalence lower than the hospital average. Acute and critical care were in the midrange: not as high, for example, as nurses working on orthopedic units report but higher than the average for the general population (50%–62% depending on the ward). It also seemed that for acute and critical care, back pain was not the only problem, with an elevated prevalence of musculoskeletal disorders. Nurses working in critical care also reported a relatively high prevalence of neck and shoulder problems. Over a third (35%–55%) of the critical care nurses in the 27 hospitals included in the survey reported having had neck or shoulder pain in the 3 months before the survey.

These data underline that for critical care, there is sufficient reason to undertake preventive action.

Exposure to physical load

Registration by means of a self-administered log (the so-called "Lift Counter" or "Lift Thermometer"[1]) [2] in 12 of the 27 hospital revealed that lifting and transferring dependent patients occurred frequently. On average, 5.2 transfers were performed per patient per 24 hours. Nearly half of these patients (46%) were almost or totally passive.

For acute and critical care, this percentage was higher, with an average of 64%. Either they were not able or were not allowed to move themselves or assist in the transfers. An additional 26% were limited in their mobility level and the remaining 10% were able to assist substantially or to move independently or with only verbal guidance. The weight of the patients (average 71 kg), their dependency level, and the type of transfer performed indicated that these transfers provided a health risk for the nurses if these transfers were performed manually. The criteria for "safe," in these cases, were derived from the revised NIOSH guidelines for the manual handling of loads. More specific assessments of the actual load were performed with the 3 Dimensional Static Strength Prediction Program (3D SSPP) software program from Chaffin [6], which also refers to the NIOSH guidelines [4].

It seemed that 39% of the patients were transferred with the help of two nurses, implicating an occupational health risk for both nurses. It did not make much difference if these transfers were performed with one nurse or with two nurses. In both cases, the resulting load still was in excess of safe limits for manual handling set by the NIOSH guidelines (3400 N) [4]. In spite of the fact that dividing the weight of the patients between the two nurses made the transfer lighter, a biomechanical analysis by means of the 3D SSPP program revealed that it did not make the transfer safe. This is in line with other research indicating that manual transfers of dependent patients should be avoided [1–3]. The conclusion, therefore, was that lifting with two nurses was not a structural solution and the guidelines for practice now state explicitly not only that one-person manual lifts should be avoided but also that two-person lifts and transfers should be avoided.

Alternatively, the frequency with which nurses in acute and critical care lift and transfer patients is not as high as in other wards or in nursing homes and homes for the elderly. There, the frequency per patient can be more than 12 per patient per 24 hours.

Also, the type of transfers was specific to acute and critical care when compared with other specialties or situations in nursing homes. It seemed that more than half of the transfers were performed within a bed itself, which is higher than in nursing homes, where they often are a third or less. Examples of these types of transfers are repositioning in bed, up the bed, or sideways; rolling over; and so forth. This means that solutions, such as mobile or overhead ceiling lifters, are not sufficient to solve transfer problems. A well-designed, high-low powered bed and the use of sliding sheets help to solve these problems and, therefore, have become part of the guidelines for practice. Another 10% consisted of horizontal transfers: from a supine position (bed, stretcher, and so forth) to another supine position (bed, examination table, stretcher, and so forth). This type of lateral transfer occurs in less than 5% of the transfers in nursing homes.

[1] This tool is a practical but validated assessment tool that assesses exposure to physically demanding tasks and compliance with the use of preventive equipment.

It also seemed that other causes of physical load, besides transfers, added to the total exposure level of nurses and increased their risk of developing musculoskeletal disorders. The static or postural load especially was high. This may occur during daily routines, such as tending to patients in bed or elsewhere (wound care, tending to drains, removing or placing needles, changing intravenous lines, or medical checks) and during periods of assisting doctors or colleagues with treatments or other types of interventions. During those activities, prolonged stooping over patients occurs. Besides static load during the periods of direct patient-nurse interaction, there is a considerable amount of static load during other activities, such as reading out the data on monitors and other types of electronic displays (often not in ergonomically ideal positions), keeping records, sorting out medication supplies, and cleaning and disinfection routines. This static load often is underestimated but may provide an (additional) explanation for increased levels of sick or personal leave. Jansen and colleagues [7] found, for example, that longer exposure to static load (with a trunk flexion over 45°) was related (relaltive risk, 3.18) especially to more serious, disabling back pain among health care personnel.

Finally, pushing and pulling also seemed to be in excess of safe values. Pushing and pulling occurred during maneuvering heavy objects, such as during the transportation of beds or heavy (diagnostic) equipment. Special types of ICU beds or special mattresses in particular resulted in loads in excess of the safe values of 200 N considered safe.

Nurses reported these problems (transfers, static load, and pushing and pulling) not only in the logs and direct measurements but also in the survey. They reported them subjectively as major problems they would like to have solved. The conclusions of subjective data and objective measurements converged, underlining the validity of the results. In addition, some nurses reported the frequent use of computer terminals and other devices and electronic patient files as unfavorable ergonomic conditions and stated that this added to their risk profile for developing musculoskeletal disorders.

Observations and expert walk-through

Finally, observations (expert walk-through on all wards in 12 hospitals) pointed to a wide range of small and large practical ergonomic problems. Some were general problems, occurring in practically all the hospitals, and some were specific to some hospitals. Patient rooms, examination rooms, and bathrooms generally seemed to have insufficient space for maneuvering beds and heavy equipment. Some locations did have sufficient space, but the space (eg, in ICUs) often was taken up completely by diagnostic and control devices. It was difficult for nurses to put themselves in an ergonomically ideal body position during transfers or nursing activities. They often were working in awkward positions. For example, some of the bags with body waste or treatment fluids were placed in difficult places and were heavy (when full) and difficult to detach without good vision (sometimes hanging under a bed or bed rail).

There often was not enough equipment in place. In some cases, nurses would have to go looking for the equipment and did not do so. They considered this as too time consuming and not efficient. In other cases, the equipment was not maintained properly or it was unclear if it was maintained properly at all (eg, no records kept). This resulted in wheels that were clean but no longer rotated easily. No maintenance records were kept for slings from lifting devices (either ceiling or mobile patient lifters) as a rule. This implied that it was unclear when the last strength test was performed and whether or not a sling was in good working order. From a patient and nurse safety perspective, this situation needed improvement. At times, the type of equipment was not optimal. In some hospitals, high-low beds were present but operated partially hydraulically instead of electrically. Apart from other disadvantages, this meant that patients were not able to operate their beds themselves, leading to unnecessary dependence and lack of mobility. In addition, nurses had to move the headrests up and down manually, an activity experienced as heavy, especially with dependent patients in the bed. Another problem occurring frequently was that mobile lifters often were present but frequently were not used because of lack of space. Overhead ceiling lifters rarely were in place. When they were present, their reach often was limited to one room and access to another room or the hall way was limited or absent.

Guidelines for practice

After this first research phase, a national task group was formed consisting mainly of nurses and physical therapists. It was their task to develop practical guidelines as a response to the major problems the studies (described previously)

pointed out. They were supported in this by human movement scientists.

This task group developed the guidelines in several stages during nearly 7 months. At each stage, they consulted with their own hospitals and their direct colleagues there. The purpose was to develop guidelines that would be simple, understandable, and practical for use in critical care itself. Although this was a time-consuming process, it was considered necessary to ensure commitment, practicality, and quality of the guidelines. This process meant that from the beginning the nurses themselves were empowered to develop and produce guidelines and implement them.

Once this national group of 15 representatives had reached consensus, the final version was offered to the national covenant committee, in which unions, employers, the health and safety inspectorate, the inspectorate of quality of care, and two government departments (health and social affairs) participated. These guidelines were signed by these parties to become official. After this, it was agreed that the guidelines for practice would form the basis for future inspections of the health and safety executive. Nationally, as of summer 2006, the final stage has been reached, in which the health and safety is starting their inspection process.

For the purpose of the article, an outline of the guidelines is given. For details, the authors may be contacted. The guidelines for practice cover the major sources of physical load identified in the research. For hospitals, this means they covered five groups. In summary the guidelines are as follows.

Repositioning in beds, on stretchers, and so forth

For all patients who are partially or totally passive and who need repositioning in bed, the use of a powered high-low bed in combination with the use of sliding sheets is necessary (Fig. 1).

For patients who have the capacity to assist or move themselves, the use of a powered high-low bed and smaller aids (monkey pole, ladder, and so forth) may be relevant and may help them to maintain or improve their independence.

When diagnostic tests need to be performed (for example, X-ray cassettes that need to be placed under a patient), a double-layer sliding sheet needs to be used to avoid having to lift a patient. When patients need to be positioned carefully for treatment or diagnostic reasons, special sets of sliding sheets must to be used (Fig. 2).

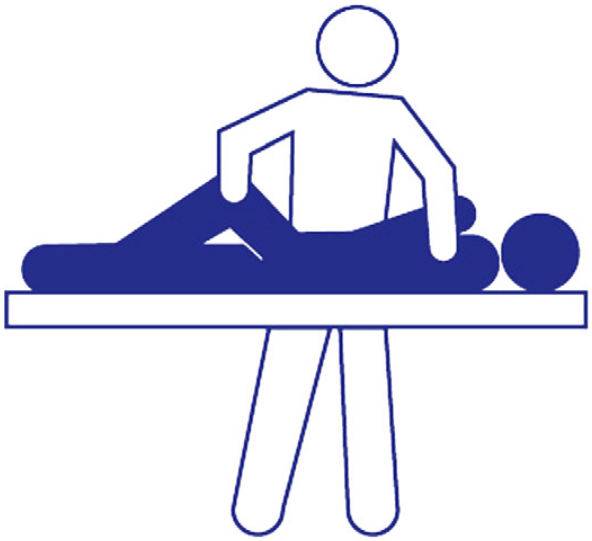

Fig. 1. Repositioning in bed. (*Courtesy of* Knibbe JJ, Knibbe NE, Geuze L. Beter, Werkpakket Fysieke Belasting Ziekenhuizen, Sectorfondsen Zorg en Welzijn, Utrecht, 2003; with permission.)

Lateral transfers (bed ⇔ bed, bed ⇔ stretcher, and so forth)

For all patients who are passive or nearly passive and who need lateral transfers, a sliding board, sliding sheets, or a lifter with a horizontal stretcher frame must be used in combination with a powered high-low bed (Fig. 3).

Transfers from bed, wheelchair, and so forth ⇔ bed or wheelchair

For all patients who are passive or nearly passive, patient lifters or hoists have to be used, either passive lifters or active lifters (Fig. 4).

Static or postural load during patient care and so forth

For any activities lasting longer than 1 minute that require a back inclination or rotation of more

Fig. 2. Positioning for treatment. (*Courtesy of* Knibbe JJ, Knibbe NE, Geuze L. Beter, Werkpakket Fysieke Belasting Ziekenhuizen, Sectorfondsen Zorg en Welzijn, Utrecht, 2003; with permission.)

Fig. 3. Lateral transfer. (*Courtesy of* Knibbe JJ, Knibbe NE, Geuze L. Beter, Werkpakket Fysieke Belasting Ziekenhuizen, Sectorfondsen Zorg en Welzijn, Utrecht, 2003; with permission.)

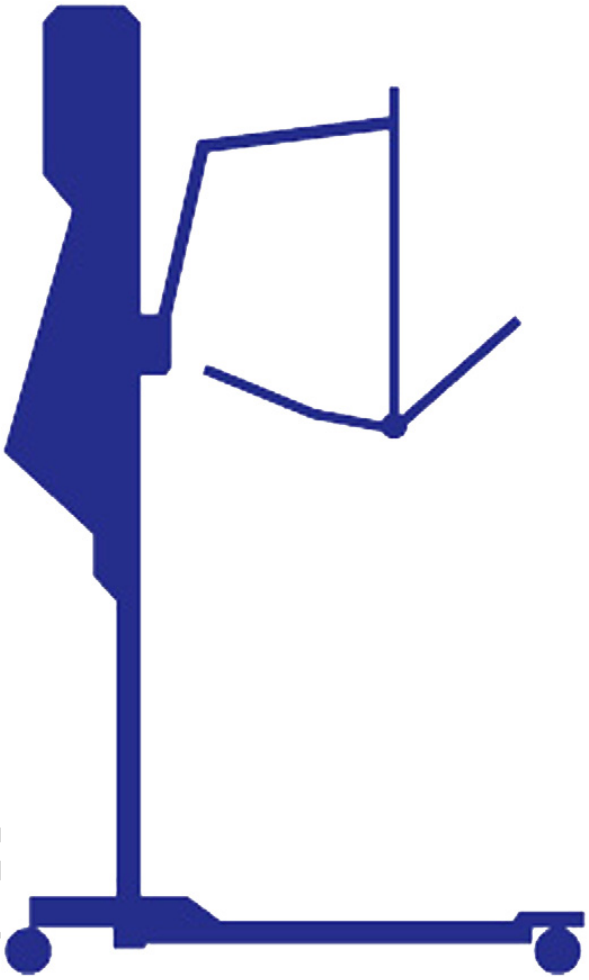

Fig. 4. Lifter. (*Courtesy of* Knibbe JJ, Knibbe NE, Geuze L. Beter, Werkpakket Fysieke Belasting Ziekenhuizen, Sectorfondsen Zorg en Welzijn, Utrecht, 2003; with permission.)

than 30°, additional equipment needs to be used (Fig. 5). This may include powered high-low devices, sitting supports, or supports for patient limbs (wound care). If this is not possible, prolonged tasks (longer than 1 minute) need to be alternated frequently among nurses, or more breaks or microbreaks need to be used. Nurses in these cases must be informed about the risks they may experience and the options they have to prevent musculoskeletal disorders.

If patients use antiembolism stockings (AES), special devices need to be used to avoid postural stress and excessive pulling forces in fingers and arms.

Maneuvering with heavy material

If the force required to maneuver an object exceeds 200 N, a powered pulling or pushing (transportation) device must be used (Fig. 6).

To encourage nurses to use optimal techniques and develop their techniques with sometimes new material and equipment, special educational material (step-by-step leaflets) was developed. This information did not replace the information that manufacturers offer with their equipment. Instead, it provided additional and practical suggestions to use the equipment or aids safely for nurses and patients. This was considered necessary because some manufacturers suggest that sliding sheets could be used for transfers out of bed to a wheelchair. The task group considered this an unsafe procedure for patients and nurses, so this technique was advised against.

Implementing change in acute and critical care

After this stage of guideline development, the implementation process started. As this was expected to be a complex process, a choice was made to train and install so-called ''Ergo-Coaches.'' On every ward, one or two nurses needed to be appointed and trained to become an ErgoCoach (also called peer leaders, lifting co-coordinators, back injury resource nurses [BIRNs], lifting specialists, mobility coaches, and so forth) [1–3,8]. In short, this ErgoCoach–nurse is responsible for starting the ergonomic process and keeping it going. These ''ergonomic ambassadors'' are available for questions, problem solving, introduction training, updates on new equipment, and so forth. ErgoCoaches can identify problem areas, can perform assessments, are consulted easily (they work on wards like any other nurse), and are trained and specialized in ergonomics. Theoretic advantages are that they are

Fig. 5. Wound care. (*Courtesy of* Knibbe JJ, Knibbe NE, Geuze L. Beter, Werkpakket Fysieke Belasting Ziekenhuizen, Sectorfondsen Zorg en Welzijn, Utrecht, 2003; with permission.)

nurses (''one of us''), they speak the same ''language,'' and they ''know what it's like,'' but most of all they interact frequently with their colleagues.

For acute and critical care, this is of vital importance, as this highly specialized setting is from time to time complex and, as the research points out, the problems are diverse in nature. It was considered that anyone outside this setting not present on the ward itself and not matching the expertise level never would be able to generate the necessary impulse for a preventive policy. In addition, the presence of and dependence on outside experts would make the process inefficient and expensive. This makes the ErgoCoach phenomenon an essential and potentially effective drive behind the ergonomic message, especially in acute and critical care.

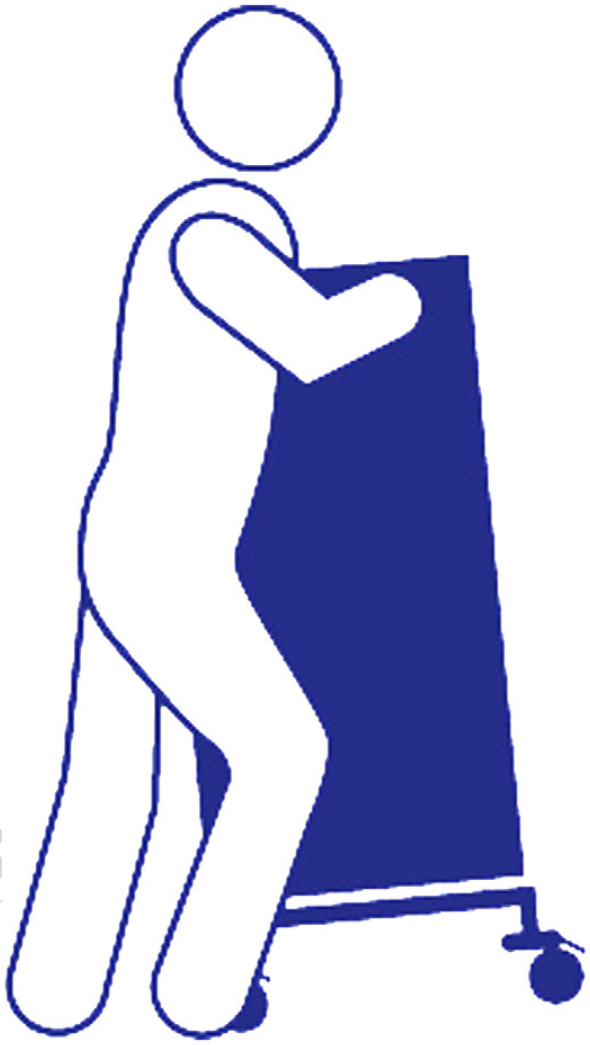

Fig. 6. Transportation device. (*Courtesy of* Knibbe JJ, Knibbe NE, Geuze L. Beter, Werkpakket Fysieke Belasting Ziekenhuizen, Sectorfondsen Zorg en Welzijn, Utrecht, 2003; with permission.)

Preliminary results

Nationally, the percentage of nurses on sick leave has decreased from 5.6% in 2002 to 4.7% in 2005 (2003: 5.1%; 2004: 4.8%) [9]. Monitoring of all the hospitals revealed that the implementation process demonstrated a typical implementation pattern [10]. Early innovators were in the lead, followed by a mid range of hospitals underway. These hospitals had made some changes and were planning for more but were not working according to the guidelines at this stage. The reasons often were oriented financially. For example, if a hospital had a collection of hydraulic high-low beds, there was an obvious need to re-invest in new powered beds. Budgetary constraints would have forced these hospitals to plan this over a period of 5 years or more. Another major reason for a slow implementation process was a difference in priorities. The national approach meant that the time frame of the whole process was a national one. Local hospitals may have made different plans already. There was, for example, one hospital that made the implementation of a policy aimed at protecting their workers against aggressive and sometimes violent patients and their relatives as their first priority. Finally, there also was a group of hospitals that had not started at all yet. An approximate division can be made of 20%/60%/20% for these three groups. The latter group now is ''gently but firmly'' pushed into taking action with some

pressure from the Health and Safety Inspectorate. Among others, they look for the presence of ErgoCoaches. In 2005, monitoring revealed that ErgoCoaches were present in 56% of the hospitals, whereas there were few (<10% of the hospitals) ErgoCoaches 4 years ago. Long-term monitoring will have to demonstrate if a higher national implementation degree will be in place and be effective.

On a hospital level, especially in the acute care situation, the hospitals that are in the lead demonstrate a variety of changes: smaller ones (such as better wheels under some of the equipment and having a longer line on the stethoscopes so that postural stress is avoided) and bigger ones (making a plan for investing in new beds that comply with the guidelines and the specific demands of acute and critical care) [10].

In conclusion, ergonomic changes in acute and critical care are relevant. The general guidelines also are relevant for this specific group of nurses and patients, but the diversity and medical complexity of this setting indicate that tailor-made solutions often are necessary. Interventions are successful but take up considerable time. A timeframe of more than 2 years is average. To implement this, strong professional stakeholdership from nurses themselves is essential. Working with ErgoCoaches on these types of wards can facilitate empowerment of the nurses themselves in this implementation process and can ensure and stimulate commitment.

References

[1] Hignett S, Crumpton E, Ruszala S, et al. Evidence-based patient handling. London: Routledge; 2003.
[2] Knibbe JJ, Friele D. The use of logs to assess exposure to manual handling of patients illustrated in an intervention study in home care nursing. Int J Ind Ergon 1999;24:445–54.
[3] Nelson AL, editor. Safe patient handling and movement. A practical guide for health care professionals. New York: Springer Publishing Co., 2006.
[4] Waters TR, V Putz-Anderson. Scientific support documentation for the Revised 1991 NIOSH Lifting Equation. Cincinnati (OH): National Institute for Occupational Safety and Health; 1991.
[5] Knibbe JJ, Hooghiemstra F, Knibbe NE. Ergonomic problems in hospitals [in Dutch]. In: Arboconvenant Ziekenhuizen, Stand der Techniek, Eindrapport. Doetinchem (The Netherlands): Elsevier; 2001. p. 1–95
[6] Chaffin DB. 3D SSPP (Static Strength Prediction Program), version 5.04. Ann Arbor (MI): University of Michigan; 2005.
[7] Jansen JP, Morgenstern H, Burdorf A. Dose-response relations between occupational exposures to physical and psychosocial factors and the risk of low back pain. J Occup Environ Med 2004;972–9.
[8] Knibbe JJ, Knibbe NE, Geuze L. ErgoCoaches in beeld [in Dutch: a view of ErgoCoaches]. Bennekom (The Netherlands): LOCOmotion; 2005.
[9] Available at: www.vernet.nl. Accessed March 30, 2007.
[10] Vree F van, Petersen A van, Knibbe NE. Monitor Arboconvenant Ziekenhuizen, Eindmeting (Monitor Follow Up), [in Dutch]. Leiden (The Netherlands): Research voor Beleid, LOCOmotion, 2005.