

The importance of body mechanics and the impact of nursing lifestyle

Mechanika ciała i jej wpływ na styl życia pielęgniarek

Stephen Wanless

Clinical Biomechanics and Musculoskeletal Injury Prevention, Lead for Posture, Movement and Handling, Birmingham City University, Faculty of Health, Education and Life Sciences

AUTOR DO KORESPONDENCJI:

Stephen Wanless

Birmingham City University, Faculty of Health

Room 454 Seacole Building, City South Campus, Westbourne Road, Edgbaston

Birmingham B15 3TN

e-mail: stephen.wanless@bcu.ac.uk

STRESZCZENIE

MECHANIKA CIAŁA I JEJ WPŁYW NA STYL ŻYCIA PIELĘGNIAREK

Personel pielęgniarski częściej cierpi na bóle w kręgosłupie dolnym niż jakakolwiek inna grupa zawodowa, częstość różni się w zależności od kraju. Aktywności związane z pracą, takie jak schyłanie się, obracanie, częste podnoszenie ciężarów, niewygodna postawa ciała oraz stres psychologiczny, są uważane za czynniki powodujące różne urazy kręgosłupa. Działania zapobiegawcze, które powinny być podejmowane w celu redukcji ryzyka bólów kręgosłupa dolnego zawierają, między innymi, ustalanie odpowiednich okresów odpoczynku, wprowadzanie programów edukacyjnych dostarczających wiedzy na temat poprawnego używania mechaniki ciała, wprowadzanie programów zmiany stylu życia.

Słowa kluczowe:

mechanika ciała, sposób podnoszenia i przemieszczania, zmiana stylu życia

ABSTRACT

THE IMPORTANCE OF PHYSICAL EXAMINATION IN NEUROLOGICAL NURSING

Nursing staff experience more low back pain than many other groups, the incidence varies among countries. Work activities involving bending, twisting, frequent heavy lifting, awkward static posture and psychological stress are regarded as causal factors for many back injuries. Preventive measures should be taken to reduce the risk of lower back pain, such as arranging proper rest periods, educational programmes to teach the proper use of body mechanics and lifestyle change programmes.

Key words:

body mechanics, moving and handling practice, lifestyle change

INTRODUCTION

Back pain is an international economic and social issue within healthcare. It is the main reason stated for sickness and absence and is a significant occupational health problem that has an influence in all areas of health care provision [1,2]. Ergonomic and musculoskeletal problems are regarded as the leading occupational issue affecting the global healthcare workforce [3]. Healthcare workers constantly rank amongst the main occupations with permanent back injuries which occur mainly from the handling of patients. Back pain studies in healthcare workers have shown a correlation between the symptoms of back pain and being in a poor posture [4], from lifting clients and patients [5] and musculoskeletal stress in the workplace [6].

Musculoskeletal injuries are a major problem for all healthcare workers and may result in life long disabilities, yet, there is no single professional body that accredits or regulates moving and handling [7]. There are organisations that publish standards and guidelines to inform health and social care organisations and trainers of their roles and duties but they are only able to provide guidance, not make regulatory statements. Healthcare workers

spend the majority of their work time with postural risks which don't directly involve patients [8].

It is not surprising that low back pain and lower back injuries are the most common kind of musculoskeletal problems caused by moving and handling. These are significant and an increasing issue within European member states [9]. Back pain is a leading work related health issue (23.8%) in the European Union, with a higher rate of work aged people (38.9%) affected within the new Member States [10]. These injuries may have serious repercussions to healthcare workers and can reduce their ability to undertake a wide range of social and work activities for the rest of their lives.

Back problems and other musculoskeletal disorders are one of the main reasons for the current and increasing shortage of healthcare workers, therefore, giving them help to prevent injury is crucial [11]. It would seem that there needs to be major inputs in to postures adopted during the patient process. In addition, static postures, frequent bending and twisting of the spine are recognised risk factors [11]. Nursing is a job that requires a lot of bending of backs, flexing of arms and legs and the pushing and

pulling of patients [7]. The nurse will use body mechanics daily in making beds, assisting patients to walk, carrying supplies and equipment, providing patient care, and carrying out other procedures; because of this, many nurses are at risk for developing physical strain and back injuries.

A report released by the Royal College of Physicians in the United Kingdom [12] highlighted the need for all healthcare workers to be advised on how to reduce back injury and pain. A review into National Health Service staff health and wellbeing stated that there should be access to early interventions for common musculoskeletal problems such as lower back injury, as this is one of the major causes of sickness and absence amongst National Health Service staff [13]. Around eighty percent of the population can develop lower back problems at some point during their life due to poor posture. Across the healthcare environment, moving and handling injuries account for over a quarter of all reported injuries to NHS employers. Nursing auxiliaries are third and registered nurses are the fifth on a top ten list of “at risk” occupations for musculoskeletal injuries; a list that includes transport drivers; elementary storage occupations and sales staff [14].

The characteristic ways that people sit, stand and walk are among the strongest of all habits, with deep roots in an individual’s personality and so changing posture may be as difficult as quitting any type of major behavioural change. People have all been told since childhood to “stand up straight” but it is easy to get into bad habits. Children are socialised from an early age into poor posture when are at school by sitting cross-legged on the floor and being made to use one-size-fits-all chairs. It is little wonder people’s posture is poor.

Good body mechanics are based on good posture [15]. Good posture is when the spine is in a “neutral” or sloppy “S” position so it is not too rounded forward and not arched back too far in what is termed as a critical “C” position. But what does good posture look like? There is no standard formula for the definition of a good posture, it is usually regarded as the most comfortable position and is considered to be the natural position of the spine in a normal, healthy person. Being in a standing position puts the spine in to a neutral healthy position rather than that in a sitting position where the spine is regarded as comfortably straight. A standing and sitting posture that help to allow the body’s organs to function normally and increases the strength of the muscles which can minimise tiredness. An optimal posture should consist of an alignment of the spine which allows biomechanical efficiency, and enables the muscles to function efficiently and position the joints in alignment. This reduces the amount of energy used and minimises any impact on supporting body structures [16].

Postures can be categorised into static or dynamic. Static postures happen when the body is almost stationary, standing, sitting or lying down. Dynamic postures are the body position during movements when a person is walking, running, or lifting. A neutral standing posture can be assessed through a comparison with the line of gravity. This is shown by a vertical line drawn through the body’s

centre, which is located via the second sacral vertebra. In optimal standing posture, the gravity line passes through the axes of all joints with all the body points aligned vertically [17]. When all body segments are within the line of gravity, there is a reduction in pressure around the joints and therefore minimum stress is placed on the soft tissue components of the supporting system. It is therefore preferable for the muscles, ligaments, and other soft tissue structures about the joints to be balanced [18].

For a neutral standing posture, the head should be well balanced above the sacrum so that the gravity line passes through the ear, the shoulder joint, and the greater trochanter of the femur, passing in front of the knee joint midline and ending in front of the lateral malleolus in a side view (Fig. 1a). In the anterior view, the line of gravity should divide the body into two halves and pass from the occiput through the tip of the coccyx and split the vertebrae and the joint axes of the hips, knees, and ankles should be equal distance from the line of gravity [19] (Fig. 1b).



■ Fig. 1. The reference line for neutral standing posture in (a) anterior view (b) lateral view. © Stephen Wanless /2015/ created using Maya 3D animation

One way to prevent these from happening is to practice proper body mechanics. Many nurses perceive the experience of a bad back as a standard physical stress of their job. Nurses understand the notion that they should correct their posture. But is it necessary? Can aches and pains after a clinical shift be linked to their “poor posture”? Even if it is, is it actually possible to improve their posture?

Maintaining a good posture is simple if you follow these few steps:

- Stand with your feet shoulder width apart.
- Create a small hollow in your lower back by tucking in the tailbone in and slightly tilting your pelvis forward.

This can be done by tightening the muscles in your buttocks and rotating your pelvis into the neutral position but be careful not to arch too much.

- Pull your shoulders back and lift your chest.
- Lift your chin until it is level and relax your jaw and mouth.

That is how to have a proper posture. An individual will be able to feel how balanced their spine is and how very little energy is required to keep it that way. If this position is practiced regularly it will become second nature to them. Being aware of your posture during all of your daily activities both at work and during social activities is the best way to ensure you are using good body mechanics.

Body mechanics also covers the area of the efficient use of the body as a machine and as a means of movement. Body mechanics focus on our body posture and balance. The bones, joints, muscles, nerves and brain all function together to maintain posture and balance. Posture is defined as the position in which the various parts of the body are held while sitting, standing, walking and lying down.

To understand body mechanics you have to understand the effects of gravity on balance. The centre of gravity of an object may be defined as the point at which its mass is centred. When we are standing upright our centre of gravity is located in the centre of the pelvis approximately mid-way between the umbilicus and the symphysis pubis. The line of gravity is a vertical line which passes through our centre of gravity. There is a constant pull exerted by the earth on every object towards its centre which helps to maintain a good posture and balance.

Better stability prevents the nurse from losing proper balance while carrying out patient care, which could result in strain or injury to muscles. You are more stable if:

- Your centre of gravity is close to your base of support
- Your line of gravity goes through your base of support
- You have a wide base of support
- Your centre of gravity is lower and closer to your base of support.

Proper body mechanics are important to the nurses in their work and they are equally beneficial to the patient, as:

- Having proper body alignment and posture can help to prevent fatigue, musculoskeletal injuries and deformities.
- Poor posture could lead to kyphosis, lordosis, scoliosis and other deformities of the spine.
- A good posture will help to promote the physiological functions of the body and can help with circulation and digestion.
- It can help to reduce the expenditure of the energy.
- It can help to maintain the balance of the body without putting undue strain on the body.

Maintenance of appropriate body alignment is the key factor in proper body mechanics. The term alignment refers to the relationship of various body parts to each other. Alignment helps balance and helps coordinate movements smoothly and effectively. Utilising a wide base of support (a stance with feet shoulder width apart)

[15] when standing is one of the basic concepts of good body mechanics and alignment that should be followed because it helps in providing better stability. Better stability prevents the nurse from losing balance while carrying out patient care, which could result in strain or injury to muscles. One of the main factors of any form of activity which impacts on the musculoskeletal system is that the longest and strongest quadriceps muscles in the legs should be used to provide the energy needs of the body. The muscles that feed in to the spine do not provide good support and strength during postural risk activities but are regularly used and are forced into exertion, strain, injury, leading to fatigue of the body tissues. The reason is that in the area of the lower back there are no long muscles. Unless the strong and long muscles of the legs are used properly during all tasks where there is a risk to your posture both clinical and social, it is likely that a back injury could occur.

During daily activities both at work and in their social lives, people spend a lot of their time on their feet. Clinical tasks that involve standing for long periods that can include bending, lifting, carrying and reaching can impact on the spine especially if proper body mechanics are not being used. The following principles should be considered to minimise the risk of injury to your spine when standing for any length of time:

- Avoid standing in one position for a long period of time. You should try to change your position as often as you can. This will help relieve stress on your spine and it will help increase your circulation and help to reduce any muscle tiredness. When you can, you should try and stretch. Gentle stretching exercises during a break can help to ease any muscle tightness.
- Be aware of your posture. Are you standing correctly? Check and double check throughout your day.
- If possible, lean on a solid surface. This can help reduce fatigue during long periods of standing.

Another important factor that affects spinal hydration is sleep. Each night while you sleep, your body restores some of the water that was lost during the day to the spinal discs, but not all of it. Your body needs plenty of water to function at its best and the spine is no exception. The spine is not able to absorb water as easily as other parts of the body and is instead dependent on the motion of the spinal discs that acts as a pump to move the fluid around. This process is known as imbibition. Imbibition is necessary for the spine to receive essential nutrients. A normal vertebral disc is close to 90% water. At night, when we are lying down, the discs slowly rehydrate. Regular movement during the day is important to keep discs hydrated, as the spine moves in the different planes of motion, the discs will absorb what water is available.

Intervertebral discs will successfully rehydrate themselves during the night, and also during the day with good movement, as long as there are adequate water levels within the body. When there is not enough water available to fully hydrate the gelatinous centre, the whole disc will become compromised. The disc is designed, when fully hydrated, so that the outer ring bears 25% of the weight load while the inner nucleus pulposus supports 75% [20].

When the inner portion is dehydrated, it cannot support its share of the load, so more pressure is taken by the outer ring, which simply was not designed for that purpose. This can cause pain, swelling, and even ruptures or herniation's of the outer part of the disc. This means that one of the simplest and most effective ways to reduce back pain is to increase your daily intake of clean, healthy water, and to be sure to have good movement throughout the day. Don't wait until you are thirsty to drink water, this means your body is already dehydrated.

One third of our time is spent in bed [21], so it is important to recognise how our bodies are positioned when we are asleep. When we are awake, the goal is to maintain a neutral spine this is still the case when we are in bed. Here's how:

- Make sure you are sleeping on a comfortable, firm mattress.
- Avoid sleeping on your stomach or with your head elevated on an oversized pillow. These positions cause the back to arch and can place stress on the spine.
- Lying on your side and back are the best positions for maintaining a neutral position and a must for anyone with back or neck problems.
- Place a pillow between your knees if you are sleeping on your side or behind your knees if you are sleeping on your back. This will help keep your spine in the right position and help to reduce any stress that may be put on the lumbar region of the spine.
- Use a pillow that allows you to keep your head aligned with the rest of your body. Having many or using an oversized pillow may look great on a bed but do not help with your back when you are sleeping.

For the prevention of injury to the nurse, principles of body mechanics should be followed by all health care professional when performing any tasks that put you at risk of musculoskeletal injury. The appropriate use of body mechanics should consistently be practiced in the workplace and in your personal life so that debilitating injuries do not happen. When it comes to movement, leading a sedentary lifestyle can contribute to a loss of water in the vertebral discs and eventually cause disc degeneration and chronic pain.

REFERENCES

1. Cheung KMC. The relationship between disc degeneration, low back pain, and human pain genetics. *The Spine Journal*. 2010;10 (11) : 958-960.
2. June KJ, Cho S. Low back pain and work-related factors among nurses in intensive care units. *Journal of Clinical Nursing*. 2011; 20 (3): 479-487.

3. Castro AB. Handle with Care: The American Nurses Association's Campaign to Address Work-Related Musculoskeletal Disorders. *Orthopaedic Nursing*. 2006; 25 (6): 356-365.
4. de Souza Petersen R, Marziale MHP. Low back pain characterized by muscle resistance and occupational factors associated with nursing. *Revista Latino-Americana de Enfermagem*. 2014; 22 (3): 386-393.
5. Lind A, Gard G. Harmful Effects in Personal Assistants Client Transfer Situations. *The Ergonomics Open Journal*. 2014; 7: 1-5.
6. Bonzini M, Bertu L, Veronesi, G, et al. Is musculoskeletal pain a consequence or a cause of occupational stress? A longitudinal study. *International Archives of Occupational and Environmental Health*. 2015; 88 (5): 607-612.
7. Wanless S. Improving the effectiveness of motor skills learning in moving and handling training for the healthcare environment. Unpublished PhD thesis, 2015.
8. Waters TR, Dick RB. [Evidence of Health Risks Associated with Prolonged Standing at Work and Intervention Effectiveness](#). *Rehabilitation Nursing*. 2014; 40 (3): 148-165.
9. Bevan S. Economic impact of musculoskeletal disorders (MSDs) on work in Europe. *Best Practice & Research Clinical Rheumatology*. 2015; 29 (3): 356-373.
10. Parent-Thirion A, Vermeylen G, van Houten G, et al. Eurofound project: Fifth European Working Conditions Survey. The European Foundation for the Improvement of Living and Working Conditions. Luxembourg, 2012.
11. Ng D, McNee C, Kieser K, Farella M. [Neck and shoulder muscle activity during standardized work-related postural tasks](#). *Applied Ergonomics*. 2014; 45 (3): 556-563.
12. Smedley J, Williams S, D'Arcy P, et al. Back pain management: Occupational health practice in the NHS in England. A national clinical audit – round 2. Royal College of Physicians. London, 2012.
13. Boorman S. NHS Health and Well-being – Final Report. Dept of Health, London, 2009.
14. Health & Safety Executive. *Work related Musculoskeletal Disorders (WRMSDs) Statistics in Great Britain 2017*. HMSO. London, 2017.
15. Wanless S. Principles for the Safe Moving and Handling of Patients. *Nursing in the 21st Century*. 2017; 15 (4): 66-69.
16. Thomas JR, Nelson JK, Silverman SJ. *Research Methods in Physical Activity*, 7th Ed. Champaign, IL. Human Kinematics, 2015.
17. Karimi MT, Solomonidis S. The relationship between parameters of static and dynamic stability tests. *Journal of Research in Medical Sciences*. 2011; 16 (4): 530-535.
18. Patel K. *Complete Guide to Postural Training*. London. Bloomsbury Ltd, 2014.
19. Bond M. *The New Rules of Posture: How to sit, stand and move*. Rochester. Healing Arts Press, 2007.
20. Dangerfield P. Chapter 4: Assessment of posture. In Eston, R, Riley, T. (Eds) (2009) *Kinanthropometry and Exercise Physiology Laboratory Manual: Tests, Procedures and data, third Edition, Volume one: Anthropometry*. London; Routledge, 2009.
21. Hirshkowitz M, Whiton K, Albert SM, et al. National Sleep Foundation's sleep time duration recommendations: methodology and results summary. *Sleep Health*. 2015; 1 (1): 40-43.

Manuscript received: 19.09.2017

Manuscript accepted: 27.01.2018



Ministerstwo Nauki
i Szkolnictwa Wyższego

„Konsultacje z zagranicznymi naukowcami i wprowadzenie dwujęzycznych (j. polski/angielski) treści do czasopisma *Pielęgniarstwo XXI wieku*” finansowane w ramach umowy 547/P-DUN/2016 ze środków Ministra Nauki i Szkolnictwa Wyższego przeznaczonych na działalność upowszechniającą naukę.